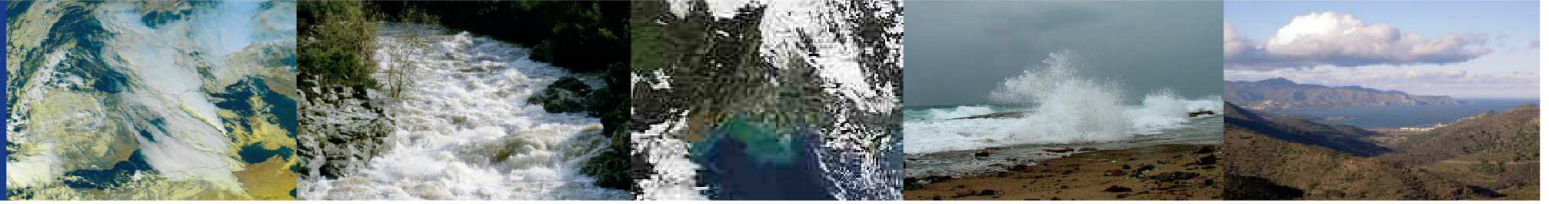


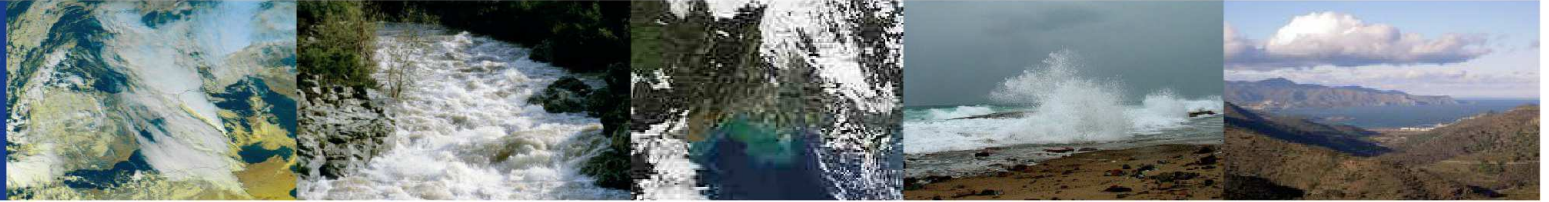
HyMeX



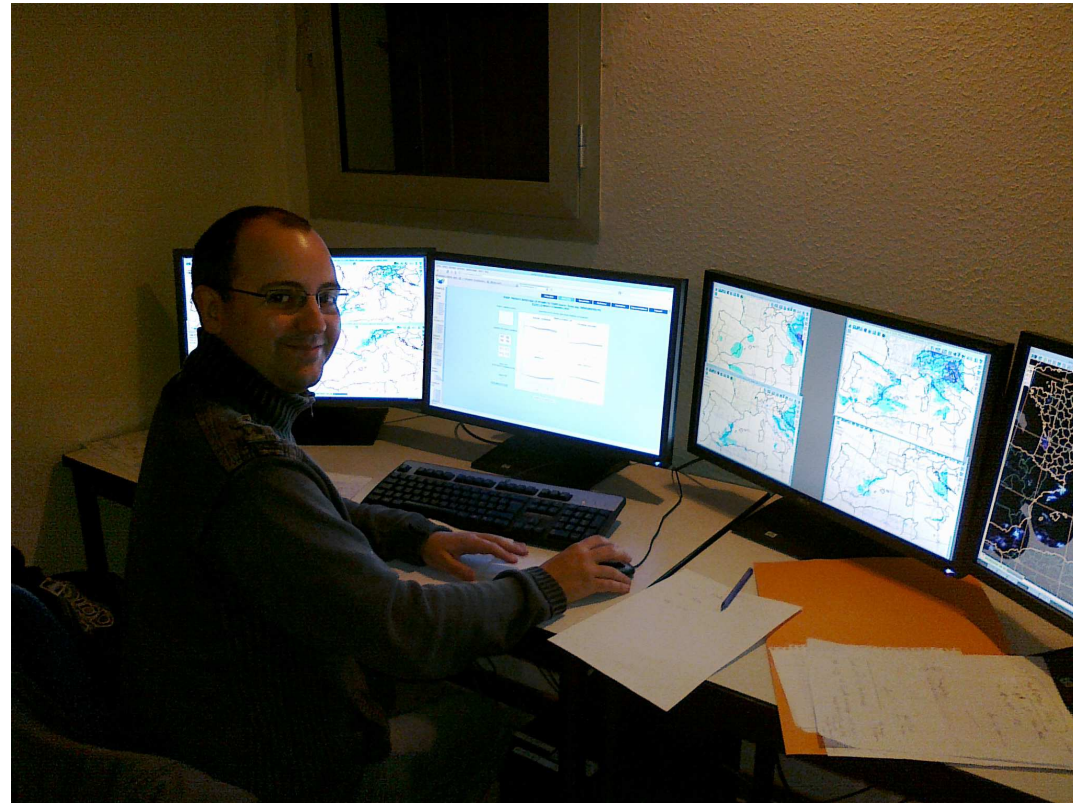
HyMeX IOP6 and Nadine, a forecaster's experience

E. Chabot
(Météo-France)

OpenIFS Workshop, French Met School, Toulouse, 7-9 June 2016



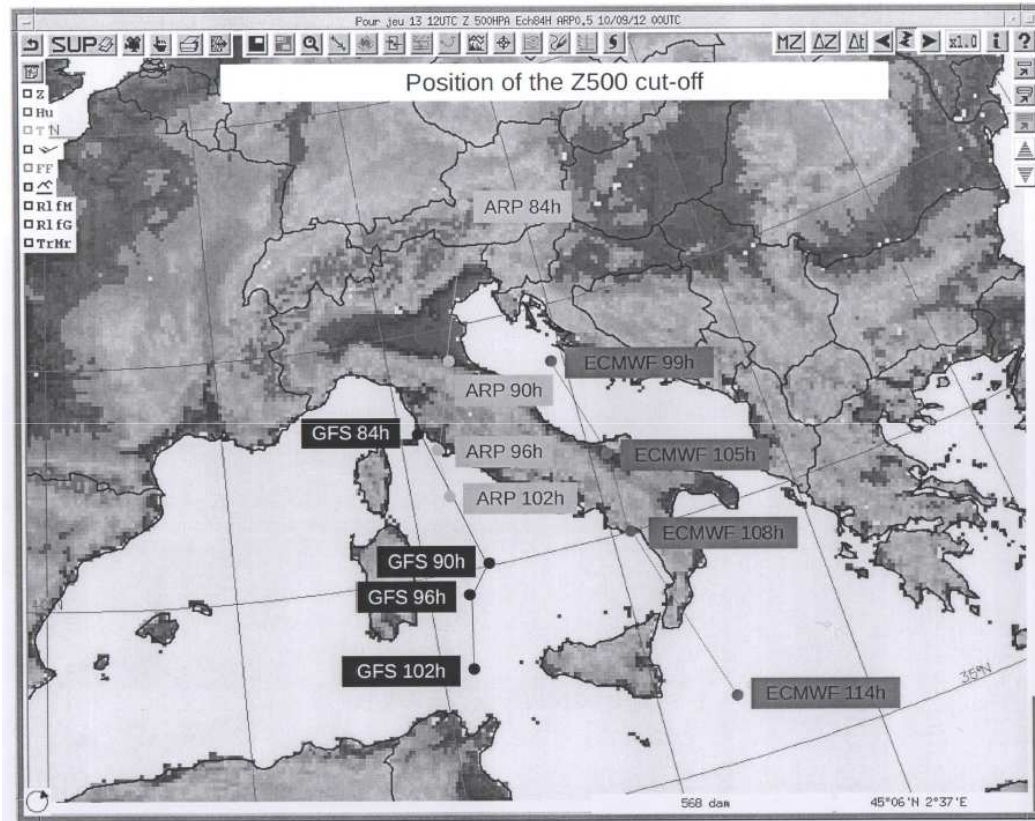
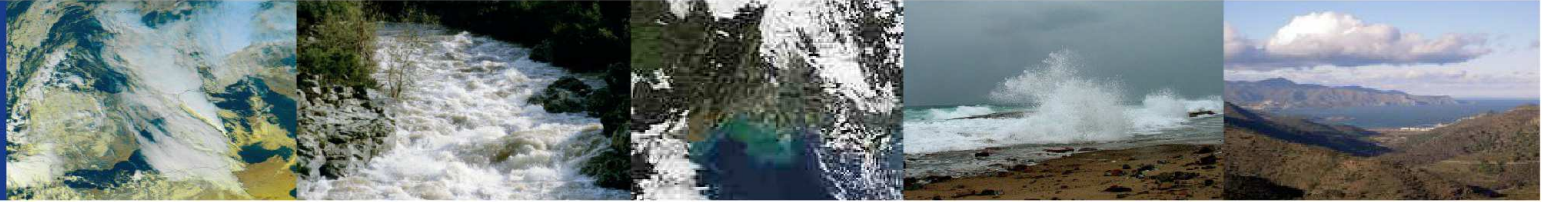
- HyMeX : HYdrometeorological cycle in Mediterranean EXperiment (2010 – 2020)
- SOP : Special Observation Period
- IOP : Intensive Observation Period
- HOC : HyMeX Operation Center
- CV : Vévennes-Vivarais area
- ORP : (shallow) ORographic Precipitation
- HPE : High Precipitation Event



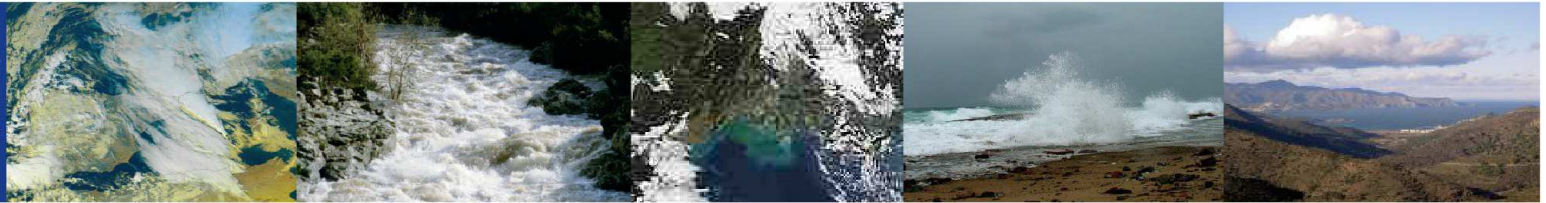
15 forecasters from Toulouse (ENM, CNP) and Aix-en-Provence (CMIRSE) were at the HOC (~ 05h -> 19h) during the 2 months of the SOP1.

+ 4 French Met School students (IENM3) from 7th to 14th Sept. 2012 !

HyMeX



Rapport d'élève



À LA UNE

HyMeX : Mieux prévoir les événements climatiques extrêmes en Méditerranée

Une campagne de mesures de grande ampleur avec plus de 300 scientifiques internationaux !

Il est primordial de pouvoir mieux prévoir les événements climatiques extrêmes de l'air méditerranéen provoquant souvent d'importants dégâts, peuvent entraîner de violentes crues rapides faisant parfois même des victimes. Ces événements intenses sont au cœur du programme de recherche HyMeX sur le cycle de l'eau en Méditerranée auquel l'INP Toulouse participe activement.

Ce projet, coordonné par le CNRM et l'IPSL, fait intervenir des experts dans les domaines des sciences de l'atmosphère, de l'océanographie, de l'hydrologie continentale et des sciences humaines et sociales, ainsi que des acteurs opérationnels comme les services météorologiques et hydrologiques. De très nombreux laboratoires de recherche sont impliqués dans HyMeX à l'échelle internationale ; parmi eux figurent le CNRM et l'IMFT, partenaires de l'INP Toulouse. Des établissements d'enseignement supérieur sont également engagés, dont l'INP-ENM (Ecole Nationale de la Météorologie) et l'Université Paul Sabatier de Toulouse.

Actuellement, une vaste campagne de mesure (nommée SOP1) est en cours. 4 avions de recherche (dont le Falcon-20 et l'ATR-42 de SAFRE) et un navire ont été spécialement instrumentés. Sur alerte, des ballons dérivants et des radiosondages peuvent être lâchés dans l'atmosphère, et des bouées dérivantes et des flotteurs largués en mer. En parallèle, les mesures depuis le sol sont renforcées sur 8 sites localisés en France, en Italie et en Espagne, avec le déploiement d'instruments atmosphériques et hydrologiques (radars, lidars, profilers de vent, radiomètres, détecteurs de foudre, ...).

Toutes les opérations de la campagne sont coordonnées depuis le HOC³, centre de décision basé à La Grande Motte (Hérault). Des prévisionnistes de Météo-France, dont 3 enseignants de l'INP-ENM, se relaient actuellement tous les jours au HOC : ils fournissent aux différents experts scientifiques présents sur place, des prévisions météorologiques jusqu'à 10 jours d'échéance, afin d'optimiser le déploiement des différents moyens d'observation. Au cours du briefing qui a lieu chaque matin, et en fonction des prévisions météorologiques fournies, la décision de déclencher une « Période d'Observations Intenses » pour le lendemain peut être prise. Ce briefing est retransmis en visioconférence dans 3 centres de décision secondaires (situés en Espagne, en Italie et en Corse), ainsi qu'à l'INP-ENM où il est enregistré à des fins d'applications pédagogiques.

Plusieurs élèves de la promotion d'ingénieurs de l'INP-ENM ont eu l'opportunité de se rendre au HOC au mois de septembre, et ont ainsi pu assister en direct aux différentes prises de décision et discuter avec les scientifiques présents sur place ; quant aux élèves techniciens en 5ème année, ils participent actuellement à un Apprentissage Par Projet en anglais, sur le thème de la campagne HyMeX.

La campagne HyMeX est financée en France par le CNRS, Météo-France, le CNES, Inra, l'INRA, le programme blanc de l'ANR et la collectivité territoriale de Corse. Elle bénéficie également de soutiens européens et internationaux. HyMeX s'inscrit dans le programme interdisciplinaire MISTRALS⁴, dédié à la compréhension du fonctionnement du bassin Méditerranéen.

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Pascal Quenot (ENM), pascal.quenot@meteo.fr
Site web : <http://www.hylox.org>
Auteurs : Véronique Durieux (ENM)
Blaise Chabat (ENM)

³ Centre National de Recherches Météorologiques (Toulouse)
⁴ Laboratoire de Météorologie Dynamique (Institut Pierre-Simon Laplace (Sorbonne-Paris4))
⁵ Institut de Météorologie des Pôles de Toulouse
⁶ Service des Avions Français pour l'Environnement et la Recherche en Environnement (Hérault)
⁷ Institut Océanique Corse
⁸ Institut National de Recherche Scientifique (CNRS, IRS, ADON, BRGA, CMA, CNRS, CNRS, ENM, IPE, IPEA, INM, INP) et Hydro-Québec.

Les 3 axes thématiques du programme HyMeX

Les 8 sites instrumentés lors de la campagne HyMeX SOP1 : VA (Valencia, Espagne), CA (Cagliari, Italie), BA (Bari, Italie), CV (Cannes, France), LT (Lyon, France), CO (Cortina, Italie), CI (Cagliari, Italie), NEI (Nîmes, France).

Glossaire

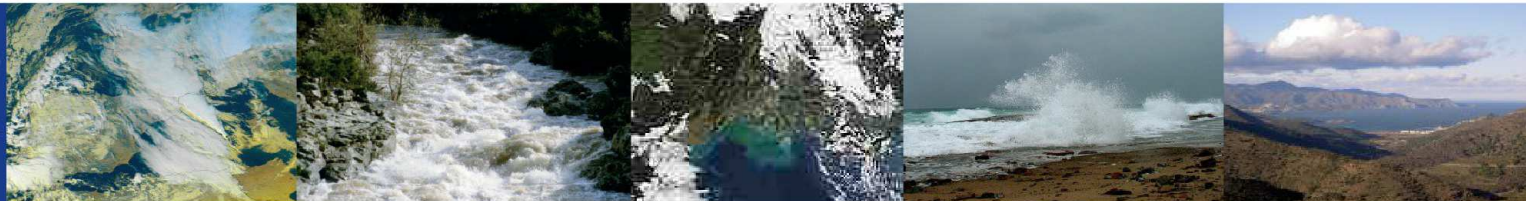
- ANR : Agence Nationale de la Recherche
- CNES : Centre National d'Etudes Spatiales
- CNRS : Centre National de la Recherche Scientifique
- ENM : Ecole Nationale de la Météorologie
- HYMEX : Hydrometeorological cycle in Mediterranean Experiment
- INRA : Institut National de la Recherche Agronomique
- Inrae : Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement
- SOP1 : Special Observation Period n°1

Perspectives

Les nombreuses données recueillies pendant la campagne SOP1 d'HyMeX fourniront probablement à terme un grand nombre de sujets de stages et de thèses susceptibles d'être proposés à des étudiants.

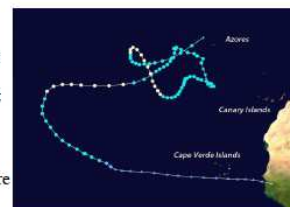
Une deuxième campagne de mesure (SOP2) est prévue en février-mars 2013 dans le cadre d'HyMeX ; elle ciblera plus spécifiquement les mécanismes de formation d'eau profonde dans le Golfe du Lion (les aux forts épisodes venteux de mistral et de tramontane).

Magazine INPT Recherche



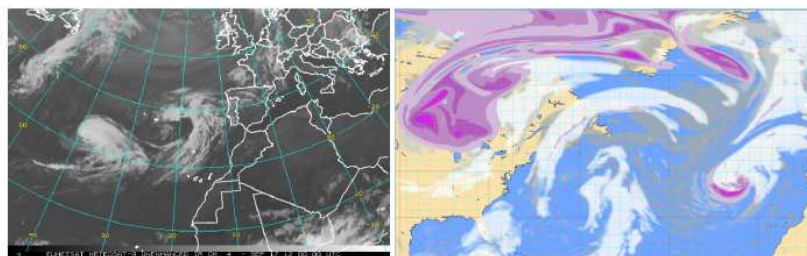
PAM : réponse quiz-photo météo de la semaine 42 :

C'est la trajectoire accomplie par la dépression tropicale devenue ouragan Nadine. Née le 11 septembre d'une onde d'Est africaine près du Cap Vert, elle a atteint le stade ouragan (64kt moyens) le 15 sep. Elle faiblit et subit une transformation extratropicale le 21 sep. Jouant le rôle d'une forte anomalie chaude de basses couches, elle interagit avec une anomalie de tropopause venue du Nord pour redonner une dépression tropicale le 24; elle fournit par ailleurs également du carburant thermodynamique pour renforcer l'interaction barocline pure un peu à l'Est (avec la même anomalie de tropopause) pour générer « the son of Nadine » (appellation des prévisionnistes du UKMO), une dépression extratropicale très pluvieuse qui a entraîné des inondations au Royaume-Uni. Nadine atteignit à nouveau la force ouragan le 28 septembre ! Enfin, épuisée par sa longue vie mouvementée, Nadine fut absorbée à l'avant d'un front froid le 4 octobre.



C'est la 5^{ème} plus longue durée de vie d'une dépression tropicale sur l'Atlantique. Mais elle restera dans nos mémoires – en tant que cyclone des Açores – par la pagaille qu'elle a créée dans les simulations numériques : l'atmosphère elle-même ne savait pas ce qu'elle allait faire de ce système hors norme à la place de l'anticyclone des Açores... la prévisibilité n'a jamais été aussi basse à quelques jours d'échéance !

ENM Hebdo



A gauche : Image Meteosat9 du 17 septembre : Nadine à gauche, et son fils à droite, né de l'interaction barocline entre carburant de la dépression alors post-tropicale Nadine et une anomalie d'altitude venue du Nord...
A droite : anomalie de tropopause (rose) s'enroulant autour de Nadine – alors post tropicale. Cela entrainera la seconde partie de vie de Nadine en tant que système purement tropical.



HyMeX

**Conférence de l'ENM
Jeudi 14 juin 2012**

à 13h45 en salle de projection(E259)

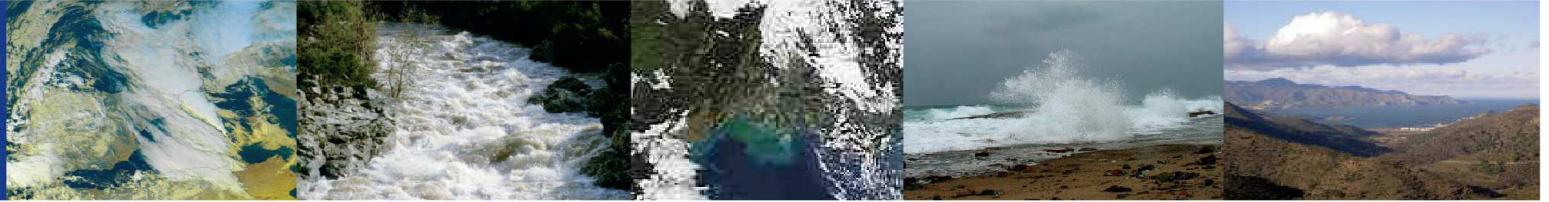


HyMeX

HYdrological cycle in Mediterranean EXperiment

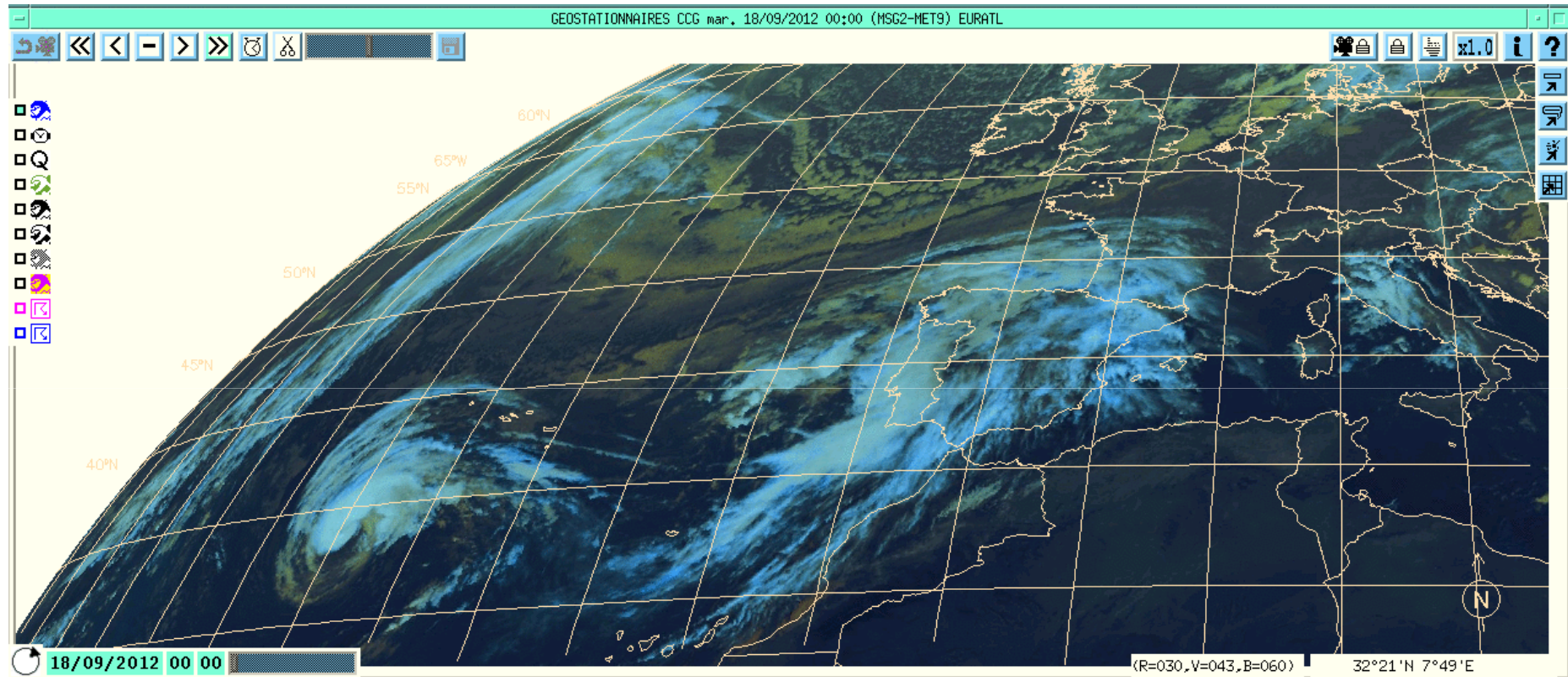
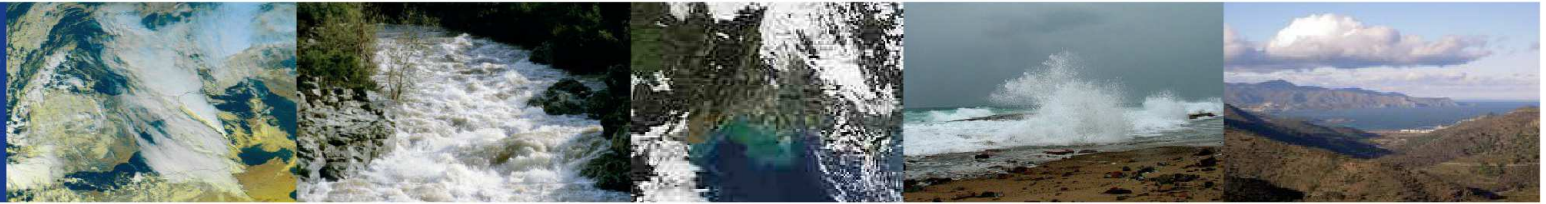
Campagne HyMeX

Conférence



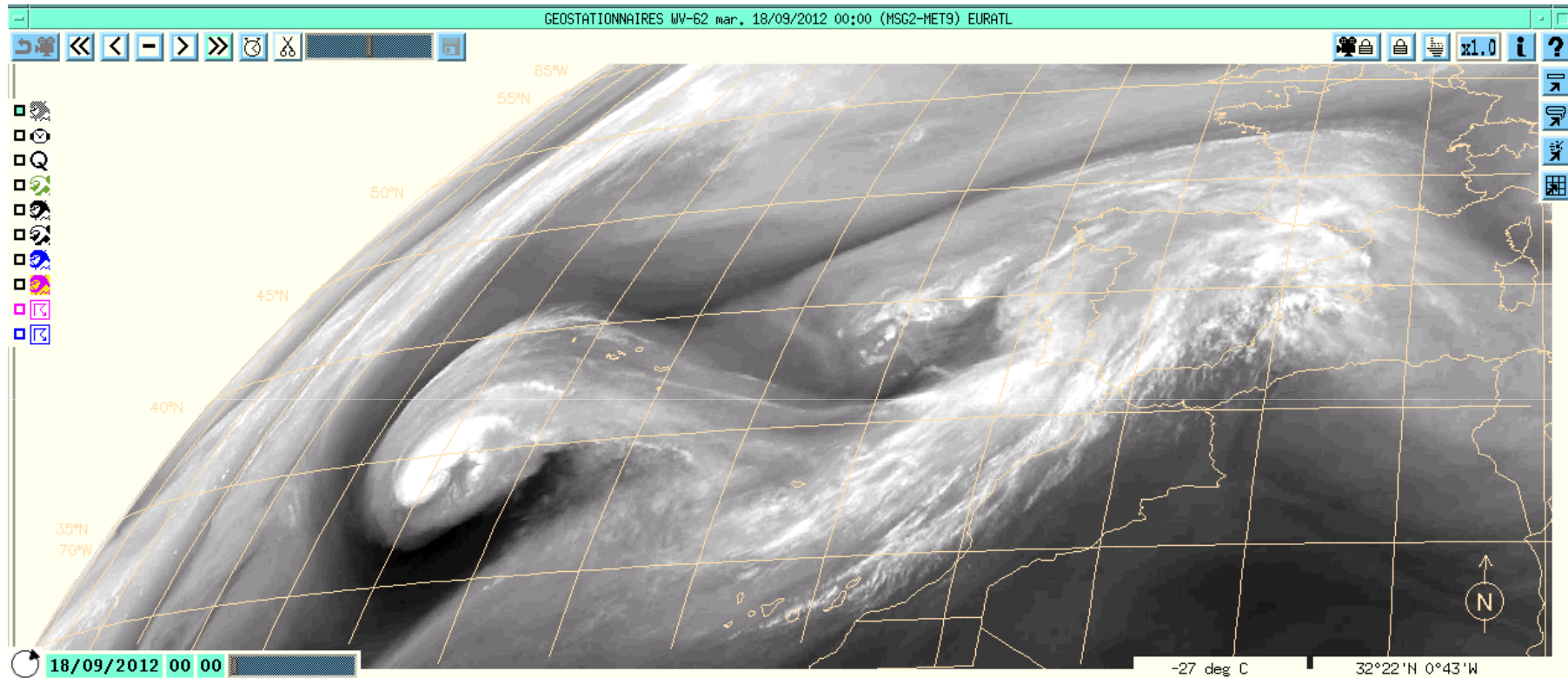
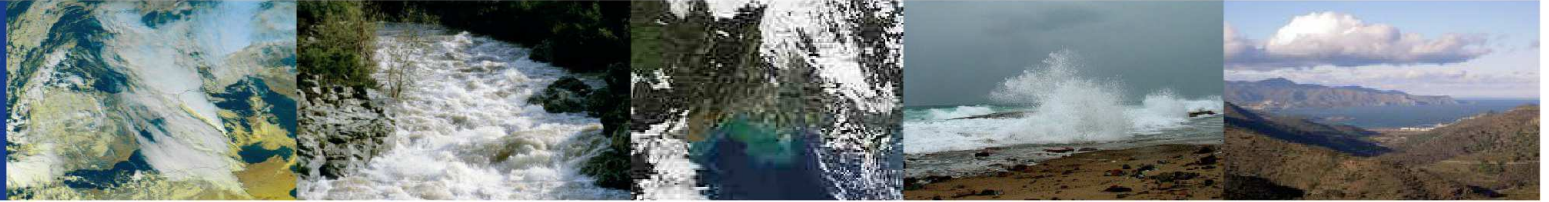
- **SATELLITE IMAGES :**
 - 18th -> 21st Sept. 2012 (animations)
 - 20th Sept. 2012 00 UTC

HyMeX



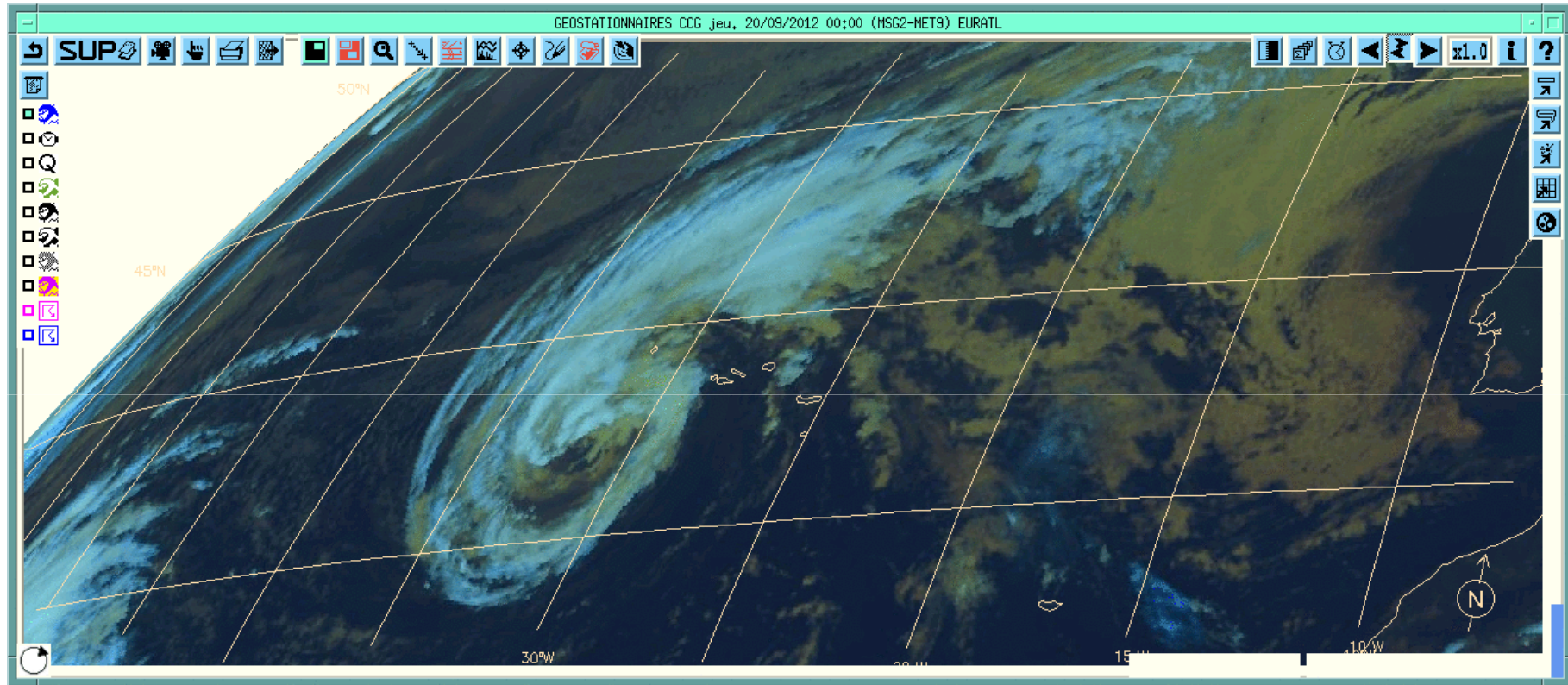
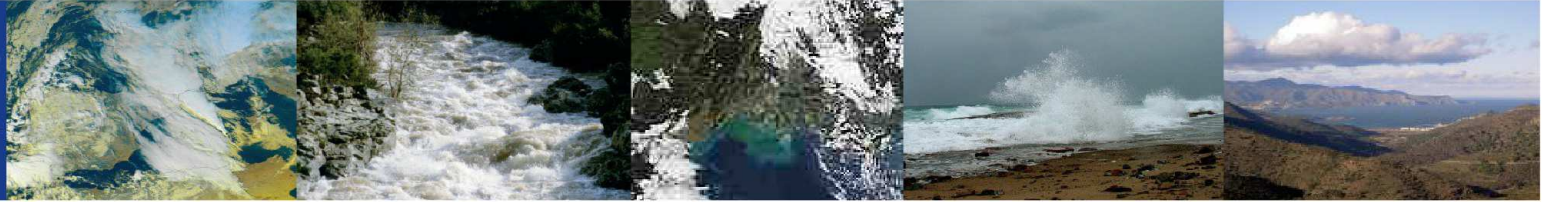
*Satellite images : Colored Composition (step 3h)
from Tues. 18th Sept. 00 UTC to Friday 21st Sept. 2012 21UTC*

HyMeX



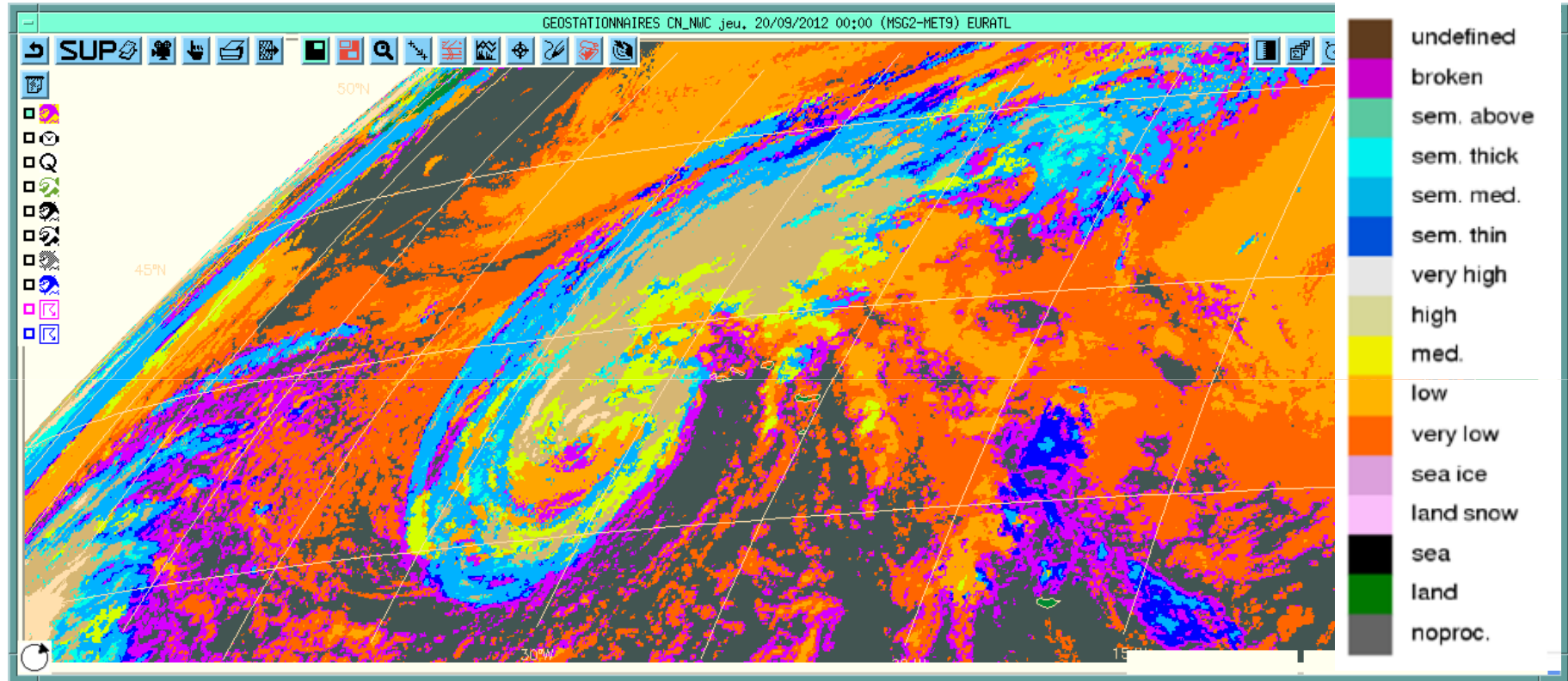
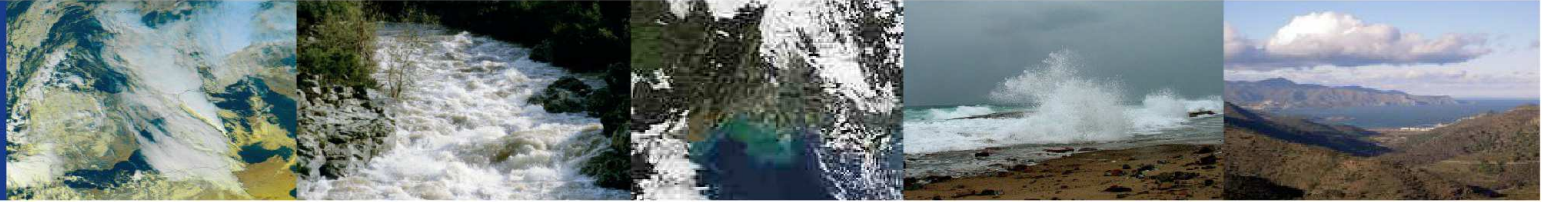
*Satellite images : Water Vapor 6.2 (step 3h)
from Tues. 18th Sept. 00 UTC to Friday 21st Sept. 2012 21UTC*

HyMeX

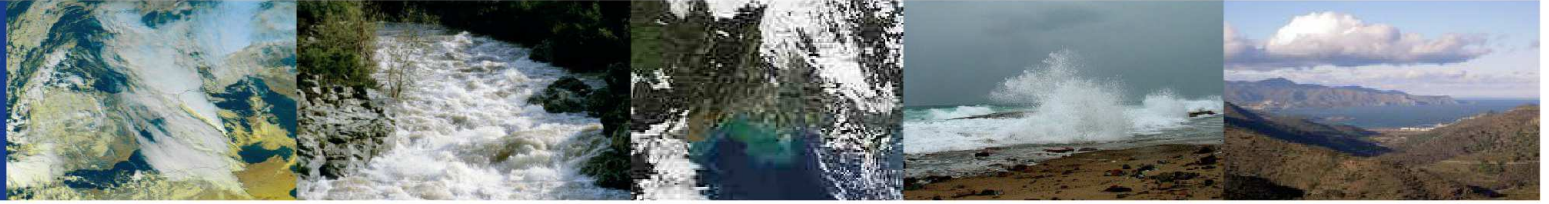


Colored Composition
Thurs. 20 Sept. 2012, 00 UTC

HyMeX



Cloud Classification
Thurs. 20 Sept. 2012, 00 UTC

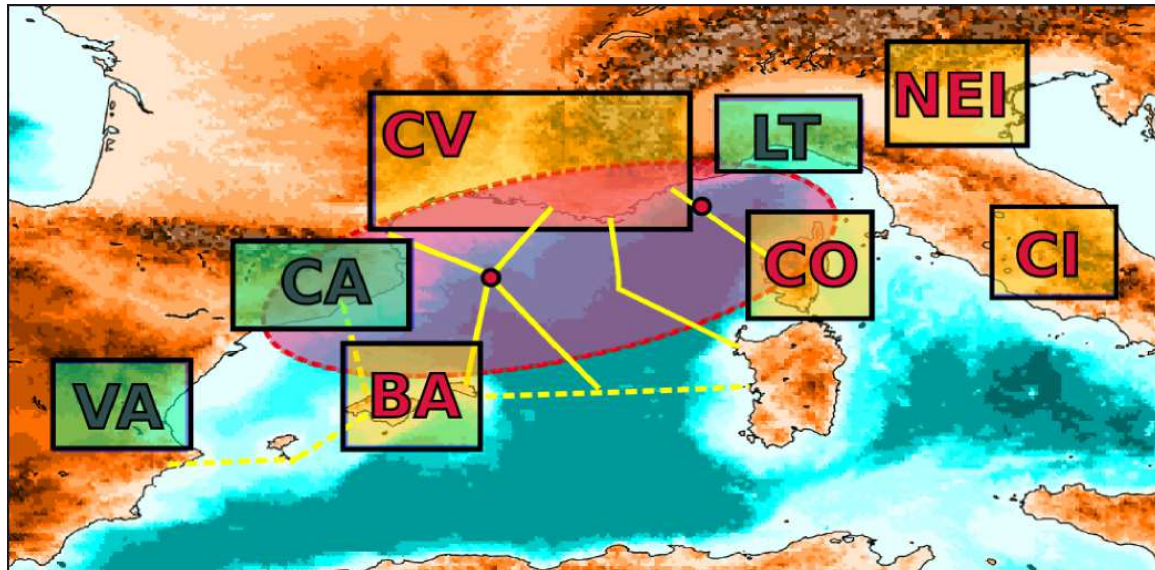


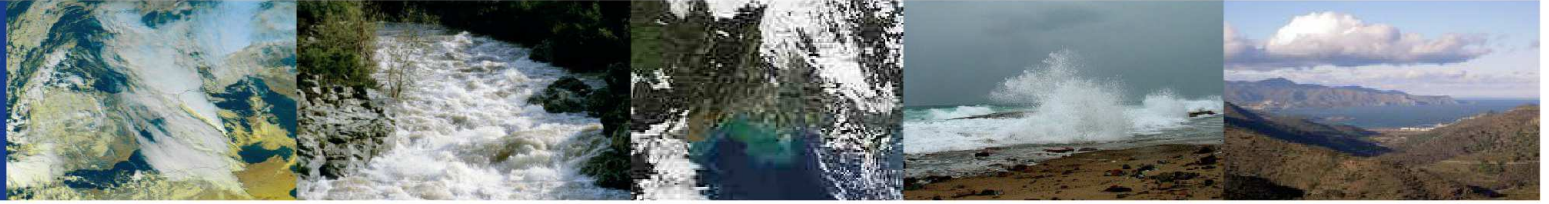
- **FORECASTS (3 days before the event...)** :

- Base : 20 th Sept. 2012 00 UTC

- Target : 23rd Sept. 18 UTC - 24th Sept. 2012 12 UTC

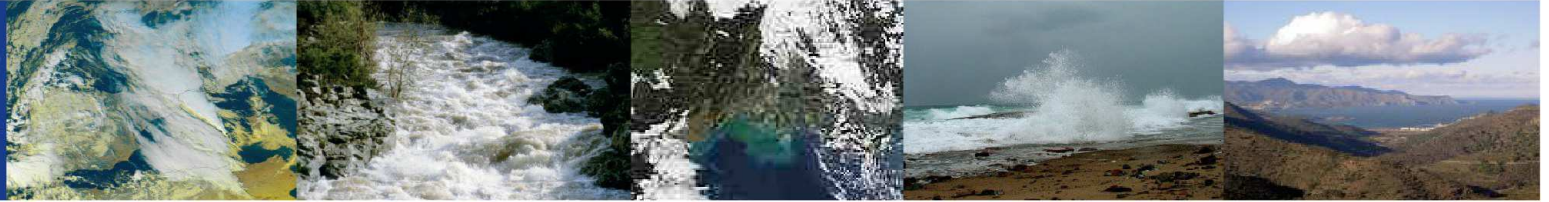
- Area of interest : South-Eastern France (CV area)





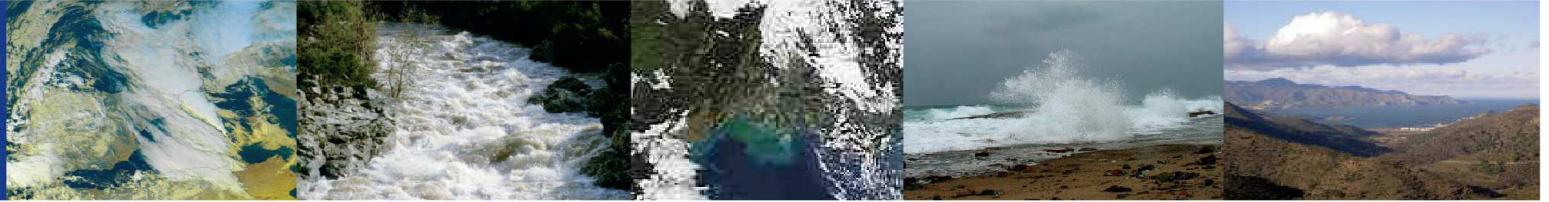
HyMeX Daily Meeting Report (19 Sept.) :

- « Related to the low predictability due to Nadine, there still is a *large spread* in the EPS, and an *important instability* in the different deterministic models or ensemble models scenarios, and in the different weather regimes privileged. »
- « The forecast made today still does not exclude an HPE over the West Med area for medium ranges, but preferentially between Tuesday and Thursday. **However, this scenario needs to be followed and confirmed in the next few days, as long as the tropical storm Nadine remains over the Atlantic basin.** »



CLASSICAL METHODOLOGY

- 1) Medium ranges (D5-D10) : Convection-parametrized models only (deterministic then ensemble approach)
- 2) Short ranges (D3-D4) : idem 1) + ARPEGE + ARPEGE-EPS
- 3) Very short ranges (D1-D2) : idem 2) + convection-permitted models = AROME-France + AROME-WMed + AROME-EPS (New !)

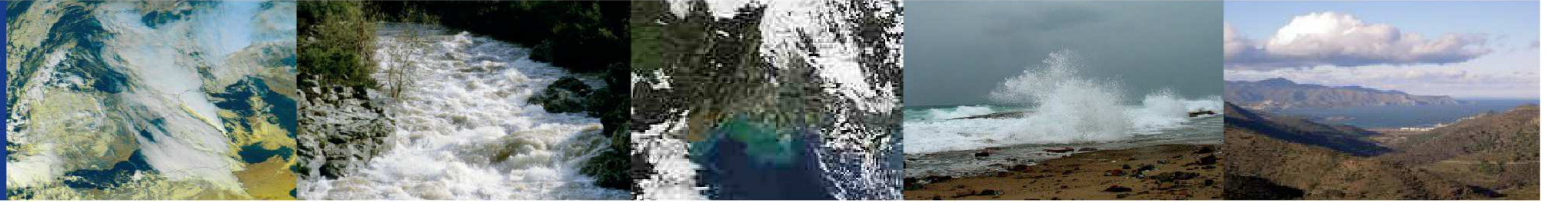


HyMeX Daily Meeting Report (20 Sept.) :

- « Related to the low predictability due to the Tropical Storm Nadine which remains located near the Acores Islands since many days, there is still a large spread in the Ensemble Prediction System of ECMWF, and an important instability in the deterministic models or in the weather regimes simulated. »

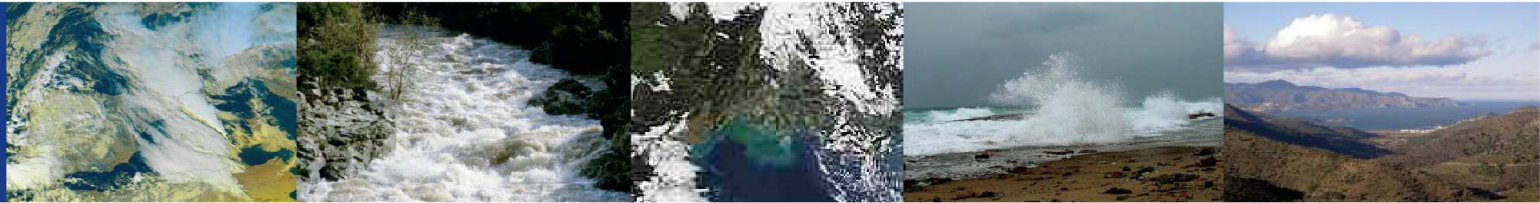
- « Yesterday, ARPEGE and ECMWF models were quite in good agreement at the end of D+3 with the positions of the main synoptic systems on the Atlantic, simulating a merging of a cut-off low with Nadine. »

- « Today, deterministic models do not simulate any more the merging of Nadine with this cut-off coming from the North. So, it is worth noting that the predictability of the models remains low. »

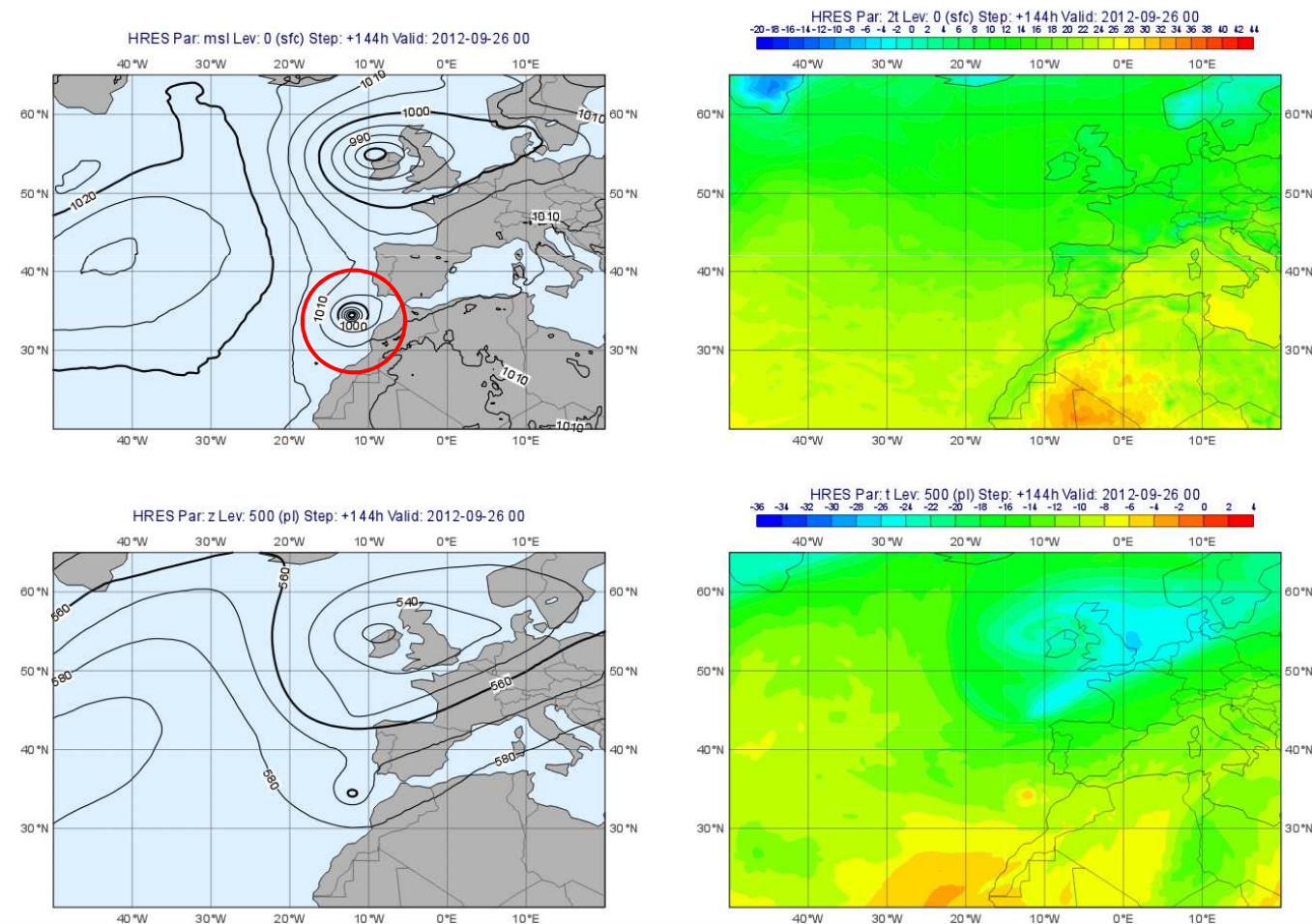


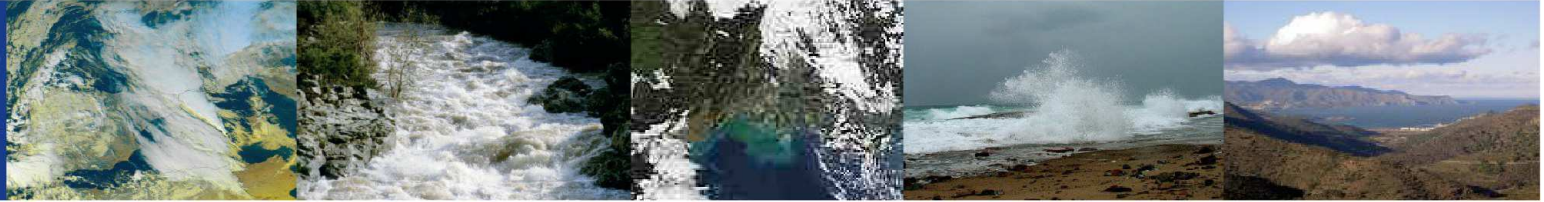
HyMeX Daily Meeting Report (20 Sept.) :

- « Note that about 20% of the members of the European Ensemble Prediction System of ECMWF (for both 19/12 UTC and 20/00 UTC runs) suggest that Nadine may be driven north-eastwards by the Atlantic trough. This is the case of several members of the American Ensemble Prediction System of NCEP as well. »
- « Both deterministic operational American (GFS run 12 UTC today) and European (ECMWF run 00UTC today) models suggest extreme event scenarios over France, respectively for Wednesday 26 September and Thursday 27 September. »

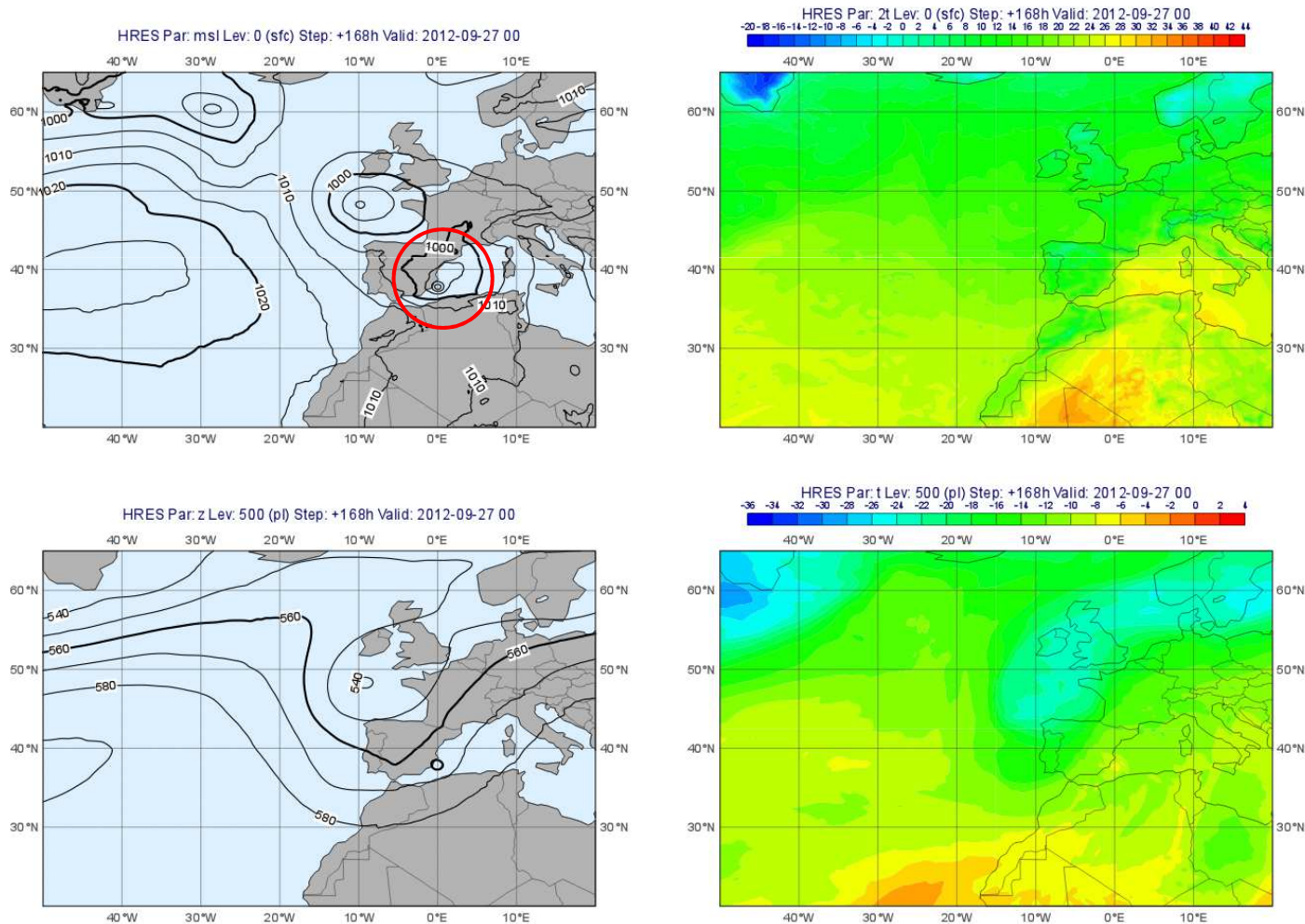


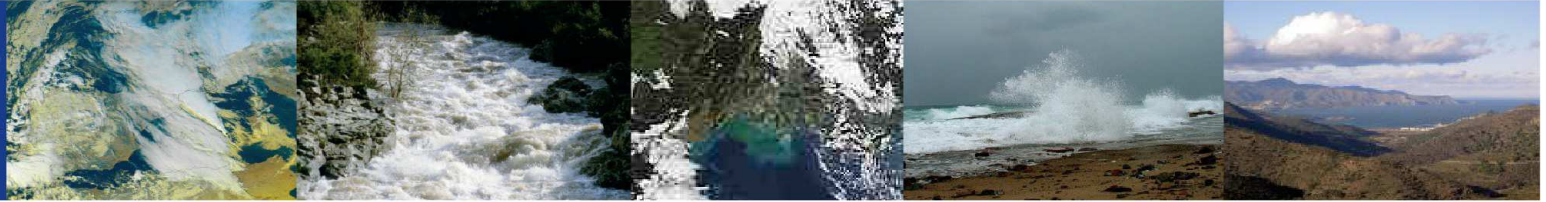
Deterministic forecast of IFS (20 Sept. 00 UTC run, range +144h)



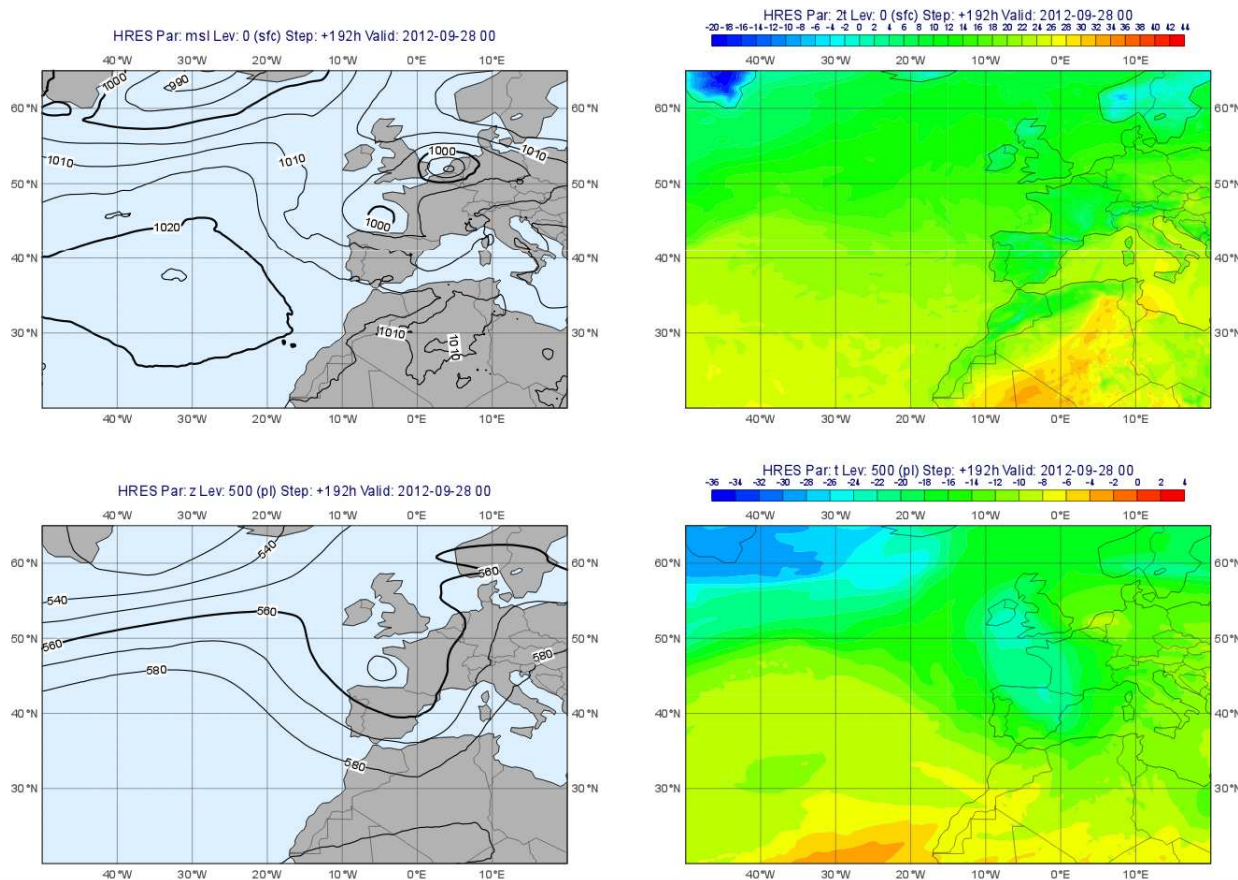


Deterministic forecast of IFS (20 Sept. 00 UTC run, range +168h)





Deterministic forecast of IFS (20 Sept. 00 UTC run, range +192h)



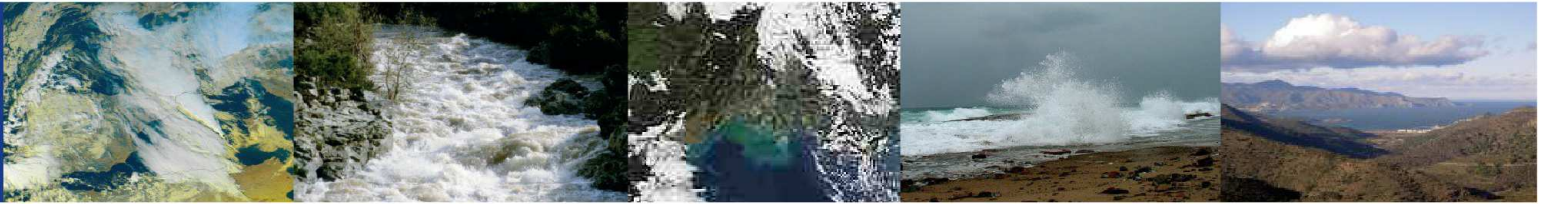
HyMeX



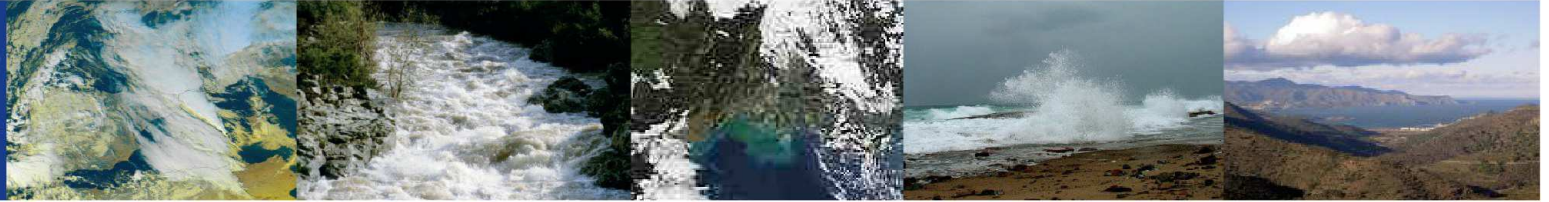
EXERCISE

- See document

HyMeX

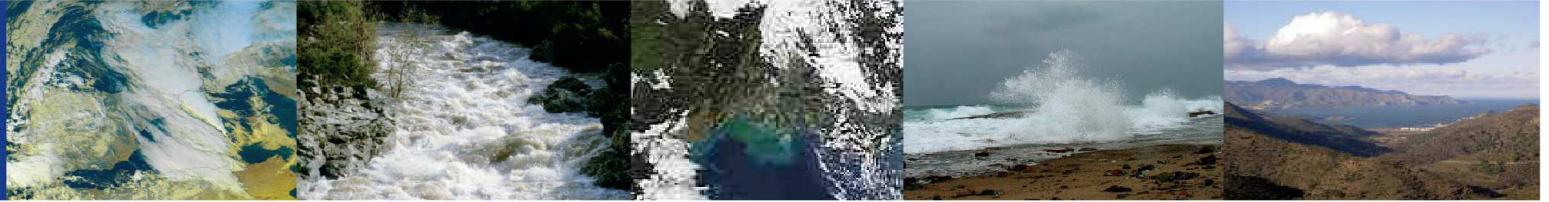


DEBRIEFING



HyMeX Daily Meeting Report (20 Sept.) :

- Mean ensemble charts of the EPS however suggest an upper-level south-westerly perturbed flow over the Atlantic which could be dominant in the first part of next week (from Monday to Thursday). This SW flow could then favour a warm-moist air advection over the West-Med area. We can remark that the *dispersion of the spaghetti is not so important*, with many members simulating a deep trough on the Atlantic.
- **Consequently, the forecast made today considers as possible an HPE over the West Med area for medium ranges, preferentially between Tuesday and Thursday. But, this scenario needs to be followed and confirmed in the next few days, as long as the tropical storm Nadine remains over the Atlantic basin.**
- After this possible HPE which could occur during the middle of week, the trough on the Atlantic could move eastward and the associated flow at 500 hPa could veer westerly. North-westerly winds would consequently blow at low levels (with a new episode of Mistral and Tramontane possible in the Gulf of Lion), bringing fresher air and calmer conditions over the West-Med Area for the following week-end.

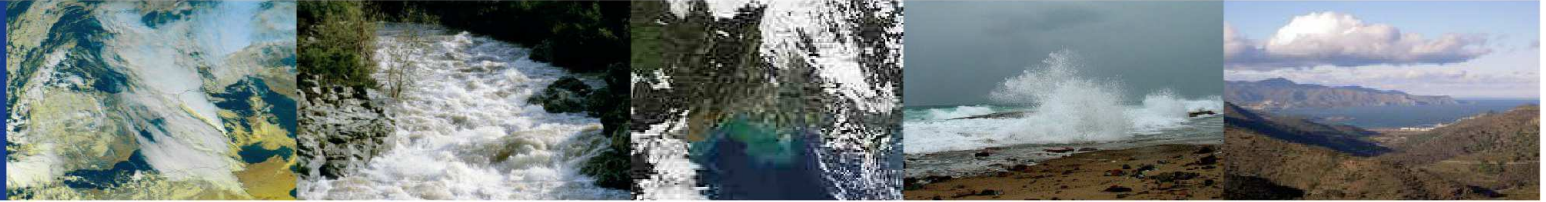


Decision process (20th Sept.) :

- **Pre-alert ORP* CV: Sunday 23 September – Monday 24 September.** Orographic precipitation expected over the Cevennes starting Sunday 23 (in the morning with GFS, in the afternoon with ARPEGE and ECMWF).
- **Pre-alert HPE** CV: Wednesday 26 September.** All models indicate a high probability of HPE over the Cevennes from Wednesday 26 to Friday 28. Most intense precipitation should be over CV but CA and LT might also be affected.

*ORP : ORographic Precipitation

**HPE : High Precipitation Event



Successive decisions taken at the HyMeX Operation Center between Thursday 20 and Sunday 23 Sept. 2012 :

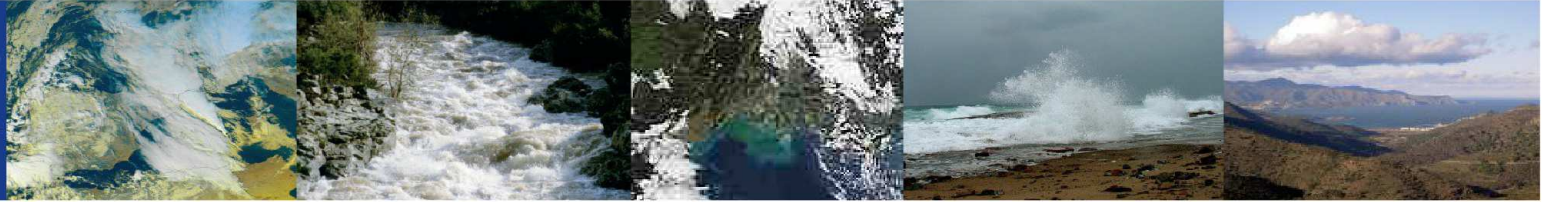
Range	Type of alert	Where ?	When ?	Additional precisions	Scheduled flights
Day - 4	Prealert ORP	CV	Sun23-Mon24	-	-
Day - 3	Alert ORP	CV	Sun23-Mon24	CV mainly concerned during night from 23rd to 24th Sept.	ATR42 (Sun 23 PM) and F-20 (Mon 24 AM)
Day - 2	Decision ORP	CV and NEI	Sun23-Mon24	CV mainly concerned between 00 and 06 UTC Mon 24	ATR42 and F-20 flights confirmed
Day - 1	Ongoing ORP	CV and NEI	Sun23-Mon24	scenario confirmed	2 Dornier flights added (Mon 24 PM)

Tab. B – Successive decisions taken at the HyMeX Operation Center after each daily briefing (from Day-4 to Day-1 day before IOP6).

See poster !

HyMeX Daily Meeting Report (23rd Sept.) :

- **IOP 6 ORP CV-NEI: Ongoing Sun. 23 Sep. - Mon. 24 Sep. :**
- Scenario of yesterday is confirmed:
IOP6 dedicated to Orographic Precipitation (ORP) is scheduled for Sunday 23 September - Monday 24 September.
A mesoscale convective system is expected to develop over CV on Monday 24 between 00 UTC and 06 UTC and to propagate eastward. Rain rates up to 60 mm/h are possible. The system should reach Italy (Milano region and NEI) in the late afternoon.
- An ATR42 flight is planned for Sunday 23 (moisture inflow, take off time 14 UTC) and a Falcon flight for Monday 24 (microphysics and radar observations, take off time 06 UTC).
- **Alert ORP CV-LT: Tuesday 25 Sept - Wed. 26 Sep.**
New opportunity for orographic precipitation and convection over CV (Tuesday 25 Sept.) and CV/LT (Wednesday 26 September). However the situation appears more favorable on Wednesday due to the passage of a short wave trough which provides upper-level dynamical forcing. High hourly precipitation rates expected.
- **Pre-alert HPE CV-CA-BA-VA: Thu. 27 Sep. - Fri. 28 Sep.**
Still a risk of HPE over CV-CA-BA-VA also possible between Thursday 27 and Friday 28. Precise chronology and location need to be confirmed
- **Other news**
Orange alert for Thunderstorm on Southern Atlantic coast issued at 16h00 loc.
Yellow vigilance for Gard/Ardèche rivers issued at 15.00 loc up to Monday 10.00 loc (vigicrue).



HyMeX Daily Meeting Report (23rd Sept.) :

- **Synoptic overview :**

- Today, on Sun 23, as a short-wave trough approaches from the near Atlantic ocean, the upper-level flow veers gradually from west-southwesterly to southwesterly. This trough, associated to strong upper-level dynamic forcing and good low-level conditions, tracks over Cévennes-Vivarais (CV) in the second part of the night of Sun 23 to Mon 24 and Mon 24 early morning. Convective activity with severe thunderstorms is therefore expected over Massif Central/Cevennes. Afterwards, this fast-moving episode shifts eastwards, and later concerns Provence and french Alps (PACA) region then Liguria/Tuscany and North-Est Italy (LT/NEI) areas.

- On D2 and afterwards, at upper levels, southwesterly flow is expected, associated with southerly flow at low levels and disturbed weather over Mediterranean area.

- On D2/Tu25, orographic precipitations are expected over Cévennes mountains and northern part of Italy. In the afternoon these precipitations can show instable characteristics (isolated thunderstorms).

- On D3/Wed26, a short-wave trough could concern the CV and North Italy, giving orographic precipitations with convective activity.

Aircraft missions :

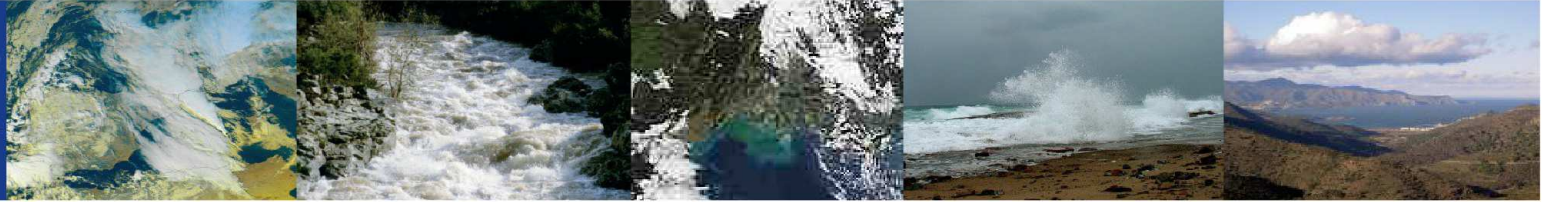
- ATR42 Sunday 14UTC -17.30UTC, to document the upstream flow
- F20 Monday 06 UTC - 10 UTC (southeastern France), to document the convective line over southern France.
- Do28 Monday 12 UTC - 16 UTC (between Corsica and Nice), to document the convective system moving to Italy.

Extra radiosounding:

- in Candillargues: at 09, 15, 21UTC (on 23/09) and 03, 09 (on 24/09)
- mobile radiosoundings: in Marseille at 15,18, 21UTC (on 23/09) and 00, 03, 06, 09, 12UTC (on 24/09)
- In Corsica at Corte: 05,08, 10,13,16UTC (on 23/09) and 08, 11UTC (on 24/09)
- In Corsica at St Giuliano: 05, 08, 10, 13, 16, 19UTC (on 23/09) and 05, 08, 11, 14, 17UTC (on 24/09)
- Data Targeting System (DTS) was activated:
 - 23/09-18UTC: Nimes, La Coruna, Barcelona, Madrid, Palma, Murcia, Gibraltar, Acores, Lisboa, Milano, Roma, Trapani, Cagliari, Udine
 - 24/09-06UTC: Nimes, La Coruna, Barcelona, Madrid, Palma, Murcia, Gibraltar, Lisboa, Milano, Trapani, Cagliari
 - 24/09-18UTC: Nimes, La Coruna, Barcelona, Madrid, Palma, Murcia, Gibraltar, Lisboa, Udine, Milano, Roma, Trapani

BLP balloon: 23/09 09.11UTC to 24/09 03.23UTC

WV lidar BASIL: in Candillargues, was able to operate quasi continuously.



- **OBSERVATIONS (a posteriori) :**
 - Night from 23rd to 24th Sept. 2012 + morning (South-Eastern France)
 - 24th Sept. 2012 afternoon and evening (Northern Italy)
 - Operational measurements (Météo-France)
 - Research measurements (via HyMeX)

Sunday 23 Sept. - Monday 24 Sept.

A trough has extended over the regions of the western Europe.

A disturbance labelled “S”, associated to the main trough, has passed over France and northern Italy during the day inducing south-westerly flow and high level cold advection.

This scenario has caused strong convective activity with thunderstorms affecting the three target areas CV (Cévennes-Vivarais), LT (Liguria-Toscana) and NEI (North-Eastern Italy)

An **intense and fast moving convective line** , related to perturbation “S”, crossed CV during the early morning of 24/09, LT by mid-day and NEI in the evening.

Summary over France :

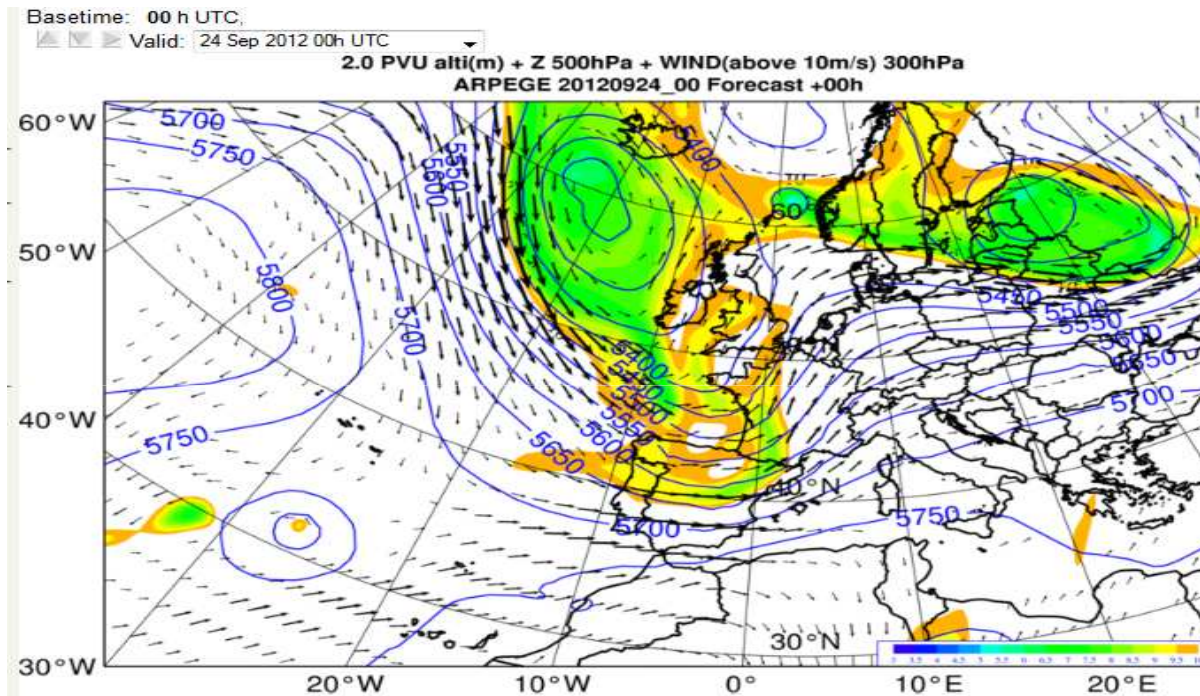
The amount of rainfall observed is ~ 100mm/24hr (CV). Rainfall intensity of 50 to 60 mm/hr and wind gusts up to 90 to 100km/h have been observed in France.

Even several days ahead, the forecast was fairly good for this active convective front. On Massif Central/Cevennes-Vivarais, severe thunderstorms were observed (showing temporarily the pattern of a V-shape cell on the IR imagery and pattern of a squall line on the radar imagery).

Summary over Italy :

IOP6 started in the early morning of Monday when the Southwesterlies started to intensify due to the deepening of the main Atlantic trough. The associated instability has developed on the central part of Liguria between Savona and Genoa. Afterward cold upper level advection triggered a squall line passing eastward from Imperia to La Spezia with the highest thunderstorm activity over the sea. The system has moved toward northeastern Italy during the afternoon.

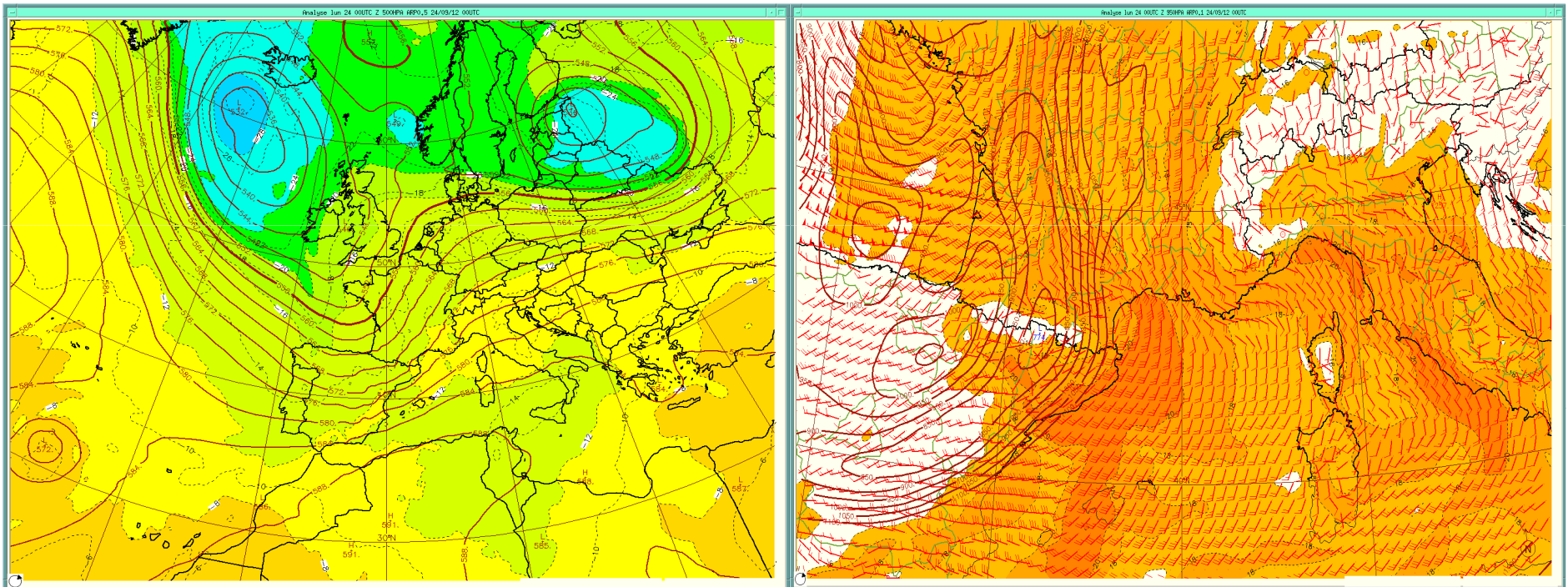
The main Southwesterly flow produced ORP over LT in the morning, LT and NEI in the afternoon (maxima of 60 mm/24h over LT and 160 mm/24h over NEI).

24/09/2012-00 : Synoptic conditions (ARPEGE)

Synoptic situation from ARPEGE model (24. – 00UTC, analysis)

In the second part of the night of Sun 23 to Mon 24 and Mon 24 early morning, a trough, associated to a strong upper-level dynamic forcing and favourable low-level conditions, has tracked over Cévennes-Vivarais area (CV), shifting then towards Italy.

24/09/2012-00 : Synoptic conditions (ARPEGE)

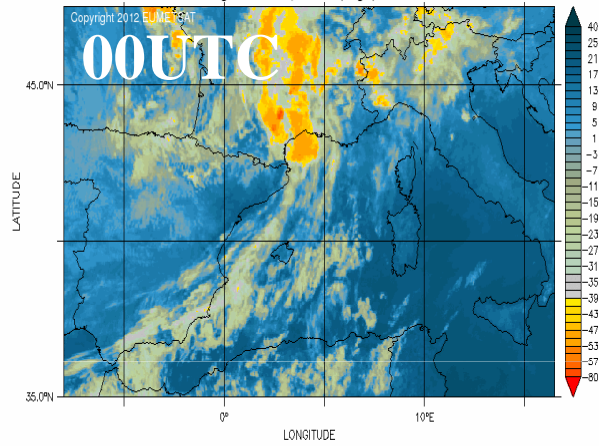


Z + T 500hPa

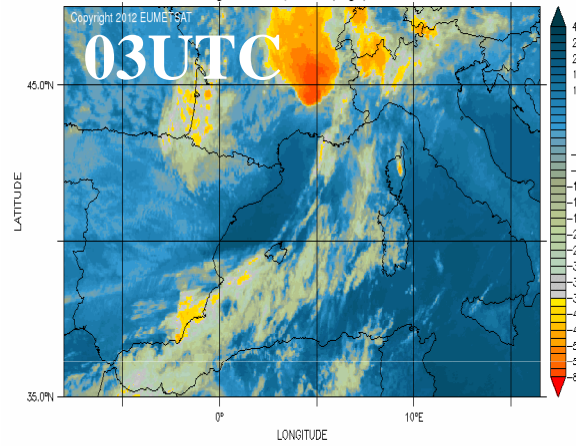
Wind + theta'w950hPa + Z 1.5pvu

24/09/2012 : IR sat imagery

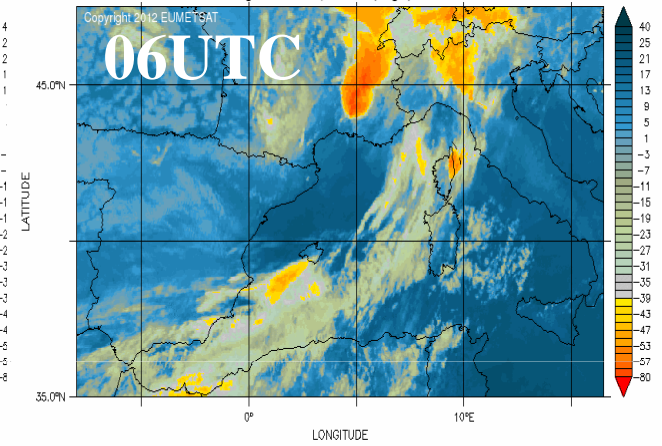
2012/09/24 00:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL



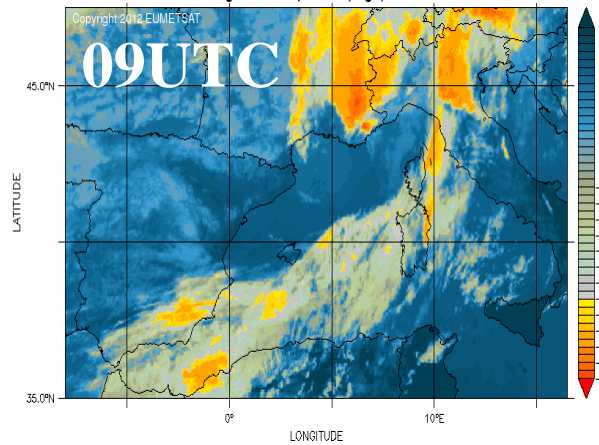
2012/09/24 03:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL



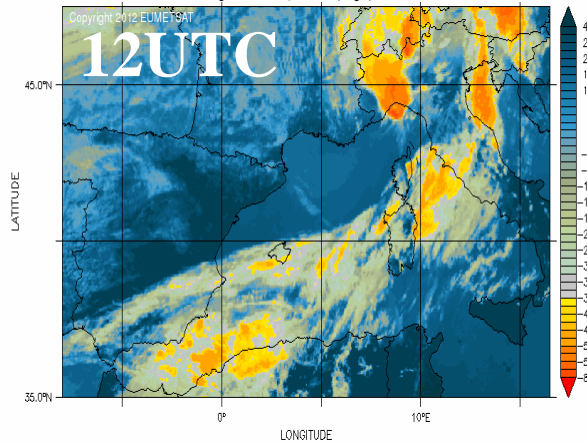
2012/09/24 06:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL



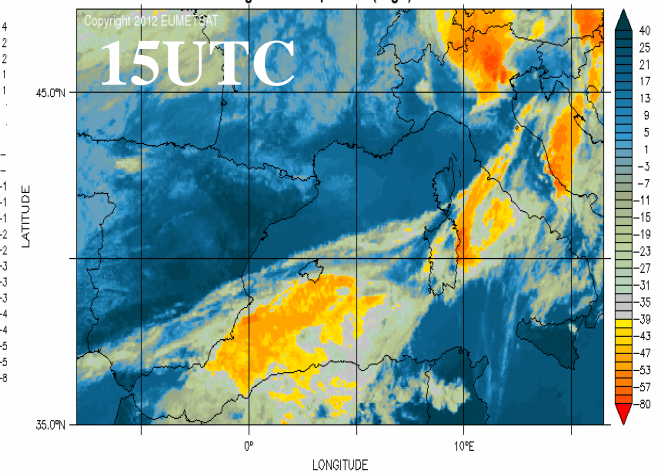
2012/09/24 09:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL



2012/09/24 12:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL



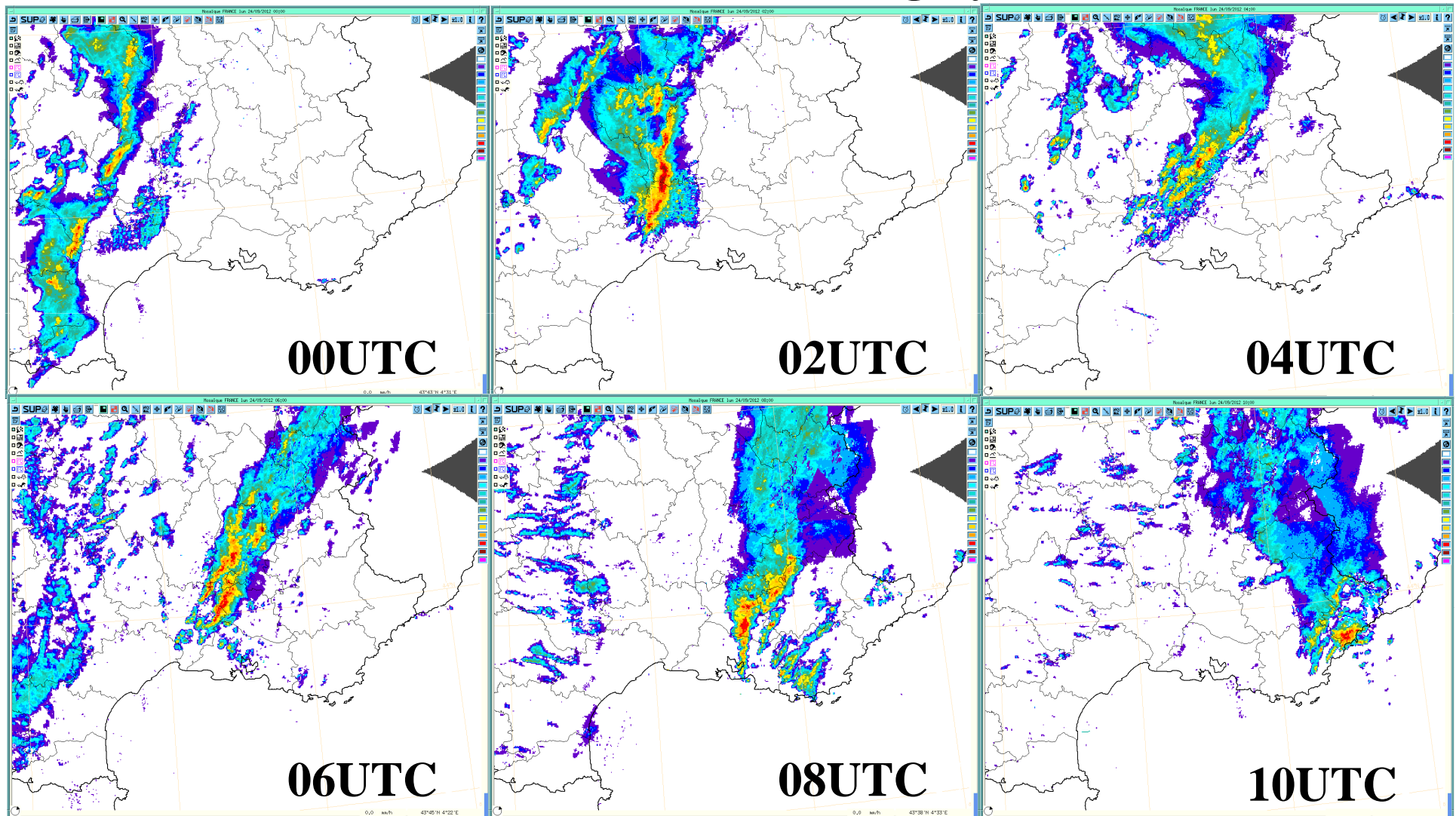
2012/09/24 15:00 MSG IR108 Brightness Temperature (degC) Source: EUMETSAT-CMS-IPSL

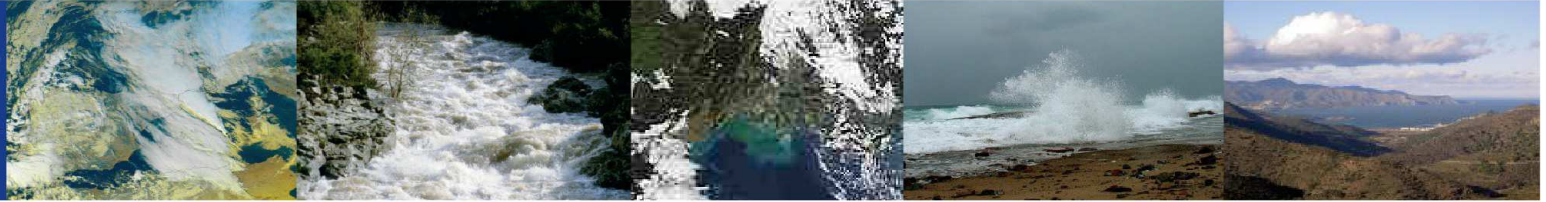


HyMeX

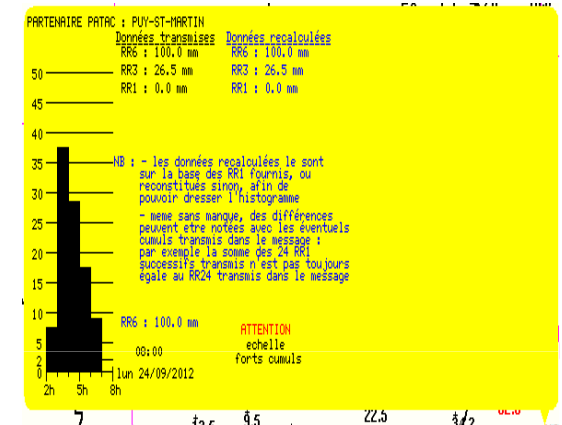
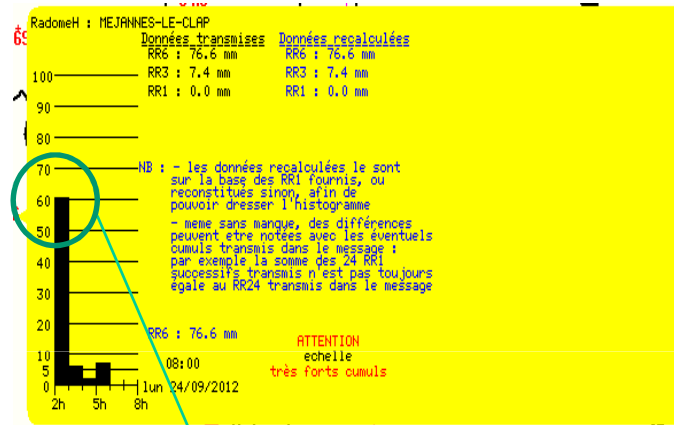
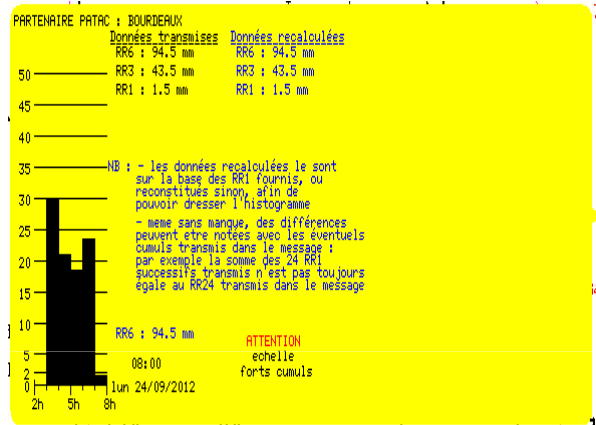
Convective system over France

24/09/2012 : radar imagery

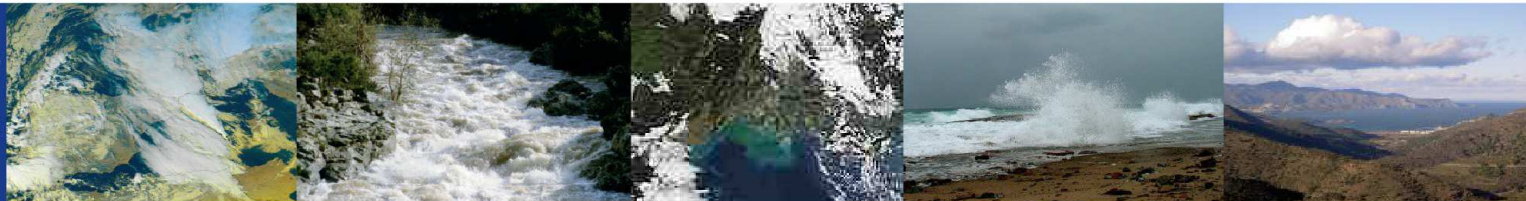




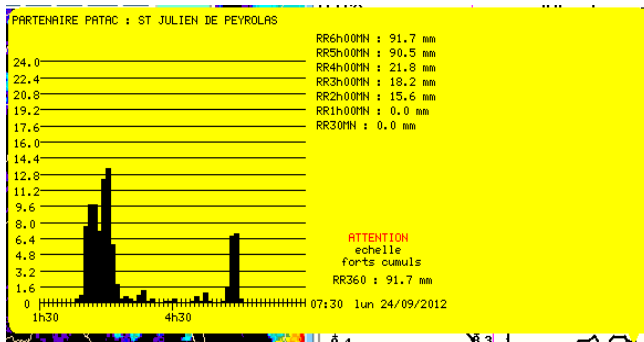
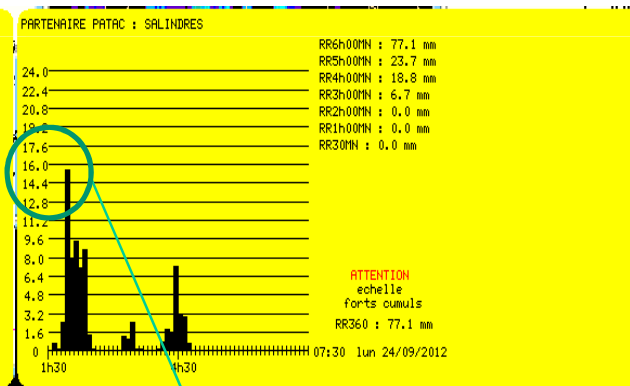
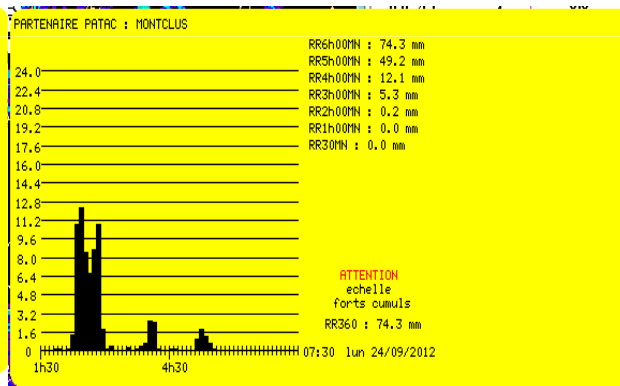
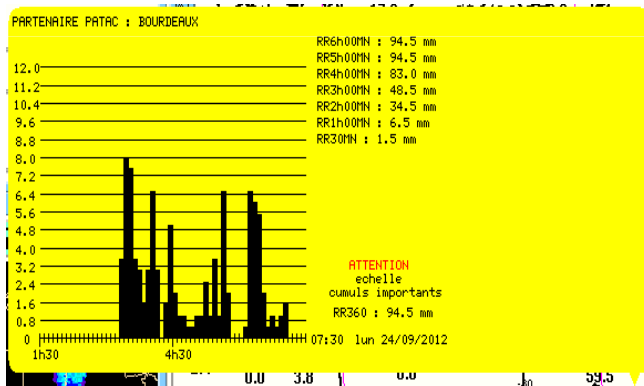
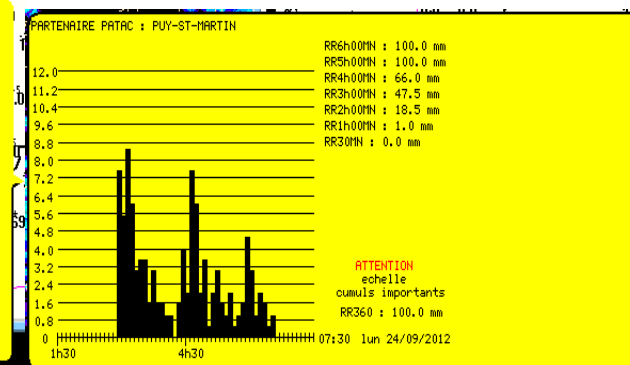
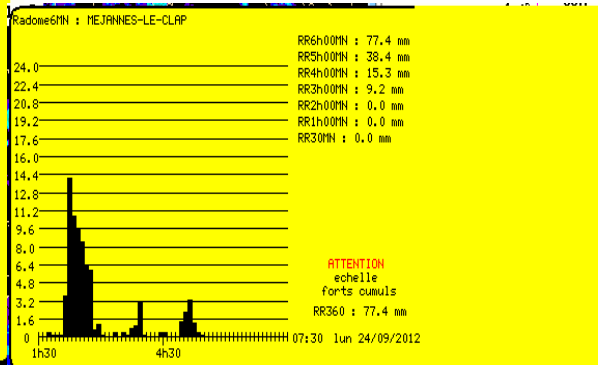
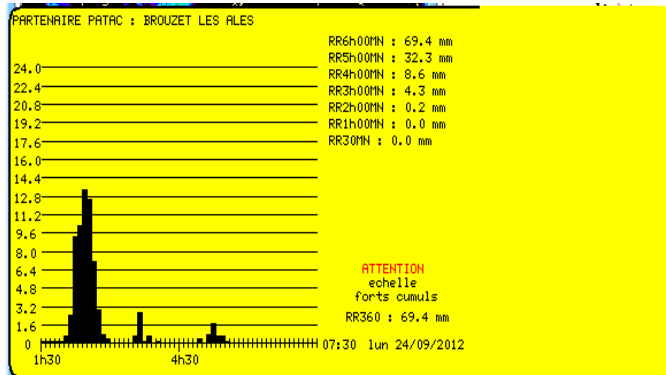
1hr cumulated rainfall amount (hyetogram)



Rain rate > 60mm/hr



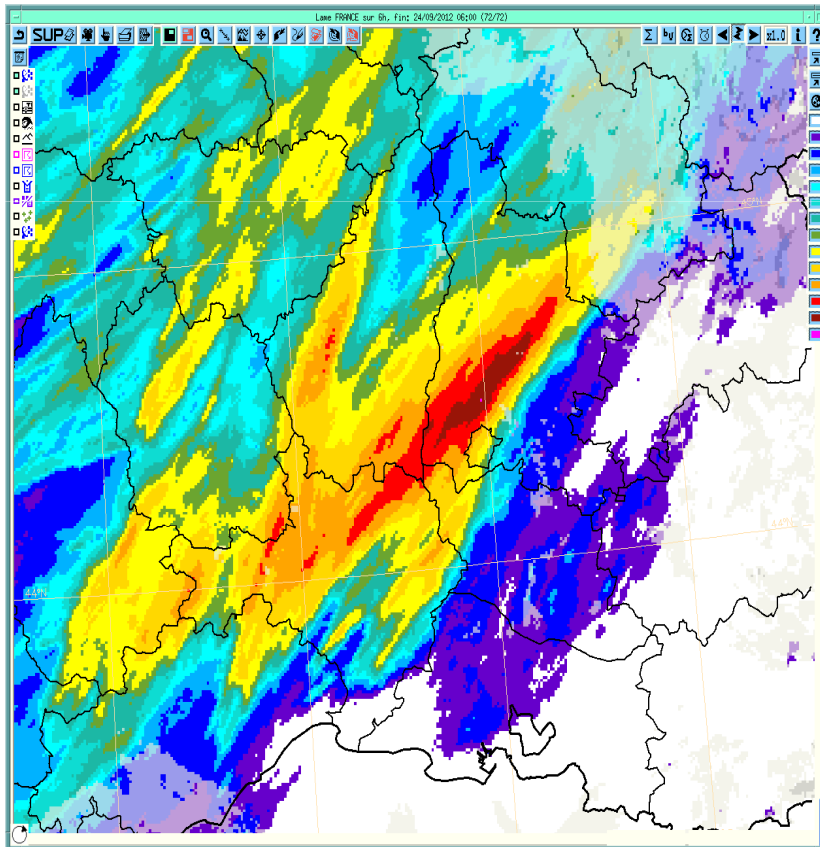
6mn cumulated rainfall amount (hyetogram)



Rain rate > 16mm/6mn

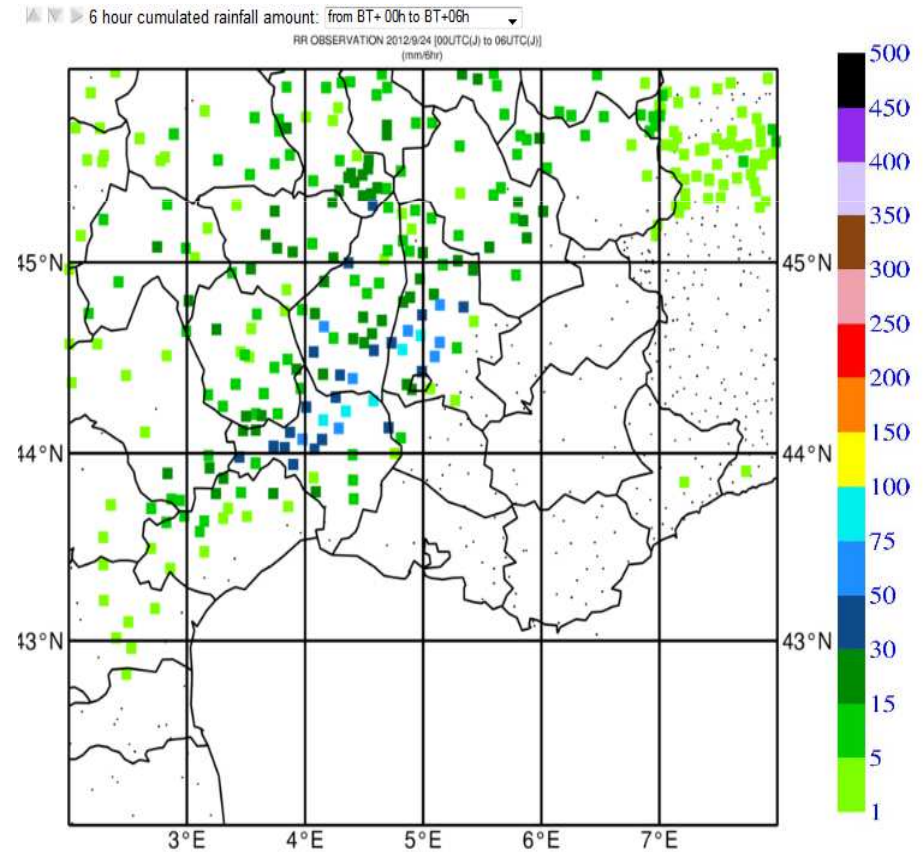
6hr cumulated rainfall amount (00-06UTC)

RADAR (PANTHERE)



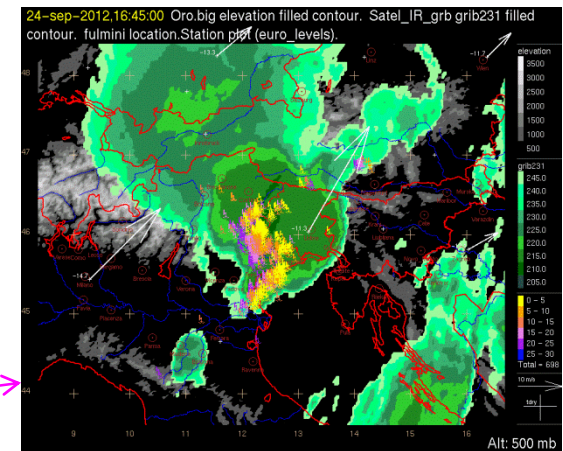
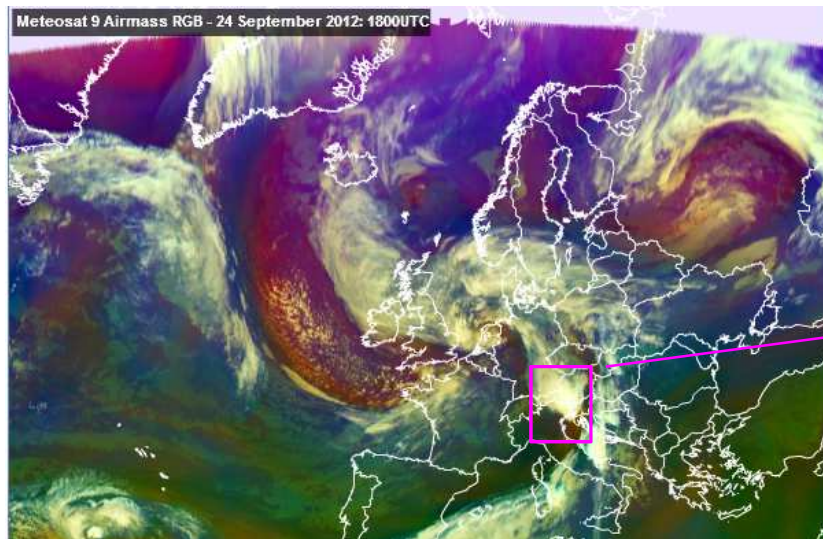
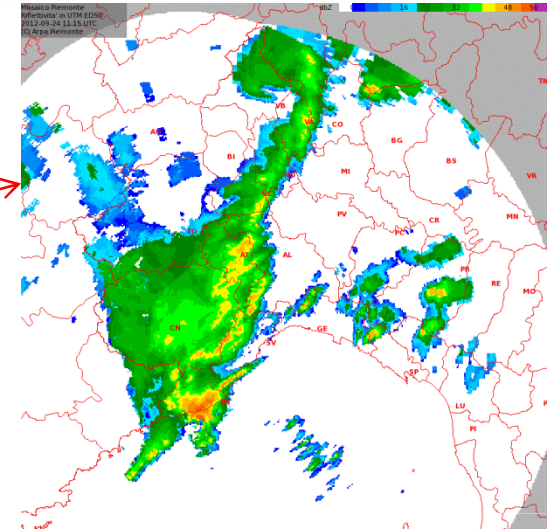
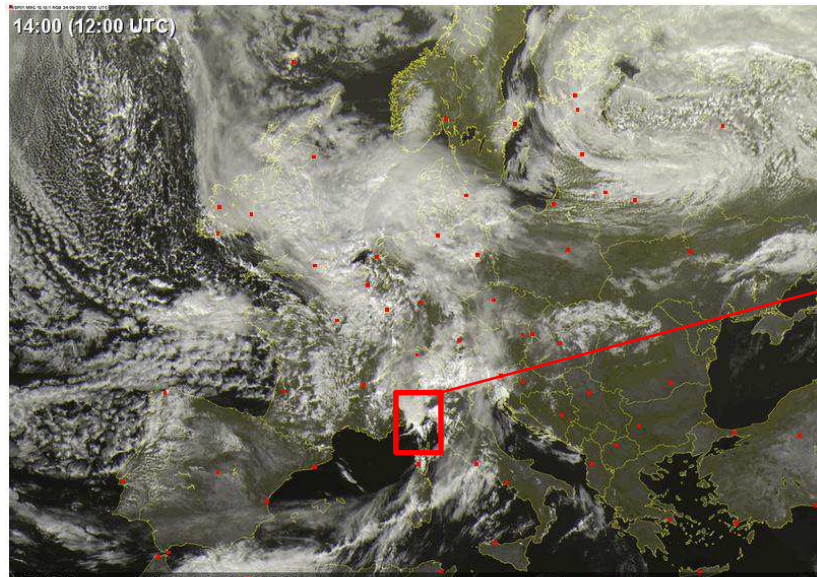
(brown > 100mm/24hr)

RAINGAUGES



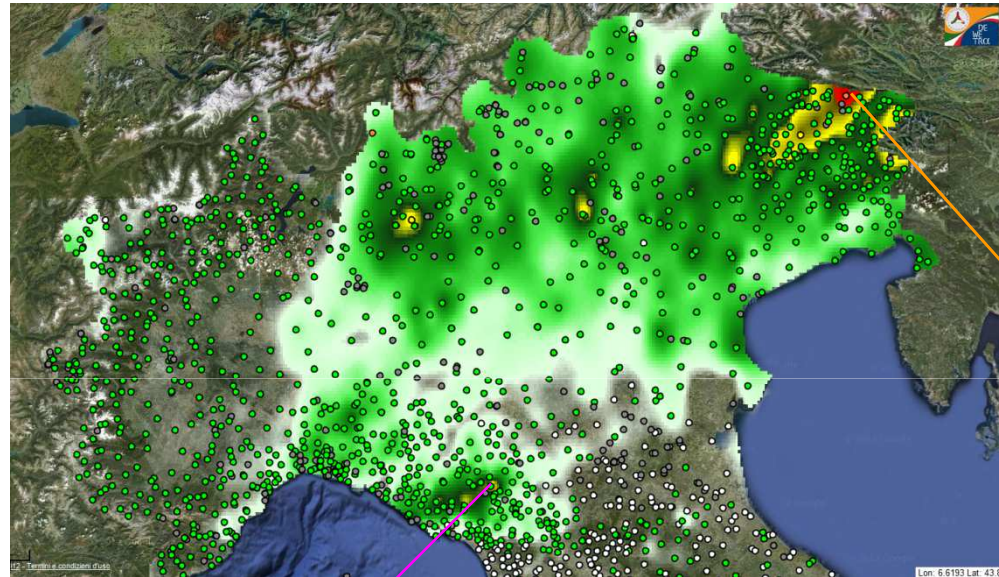
HyMeX

Convective system over Italy

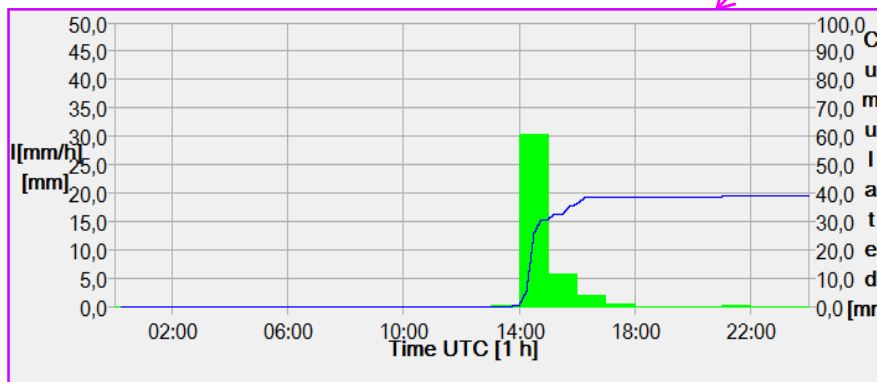


Observations: satellite and RADAR images

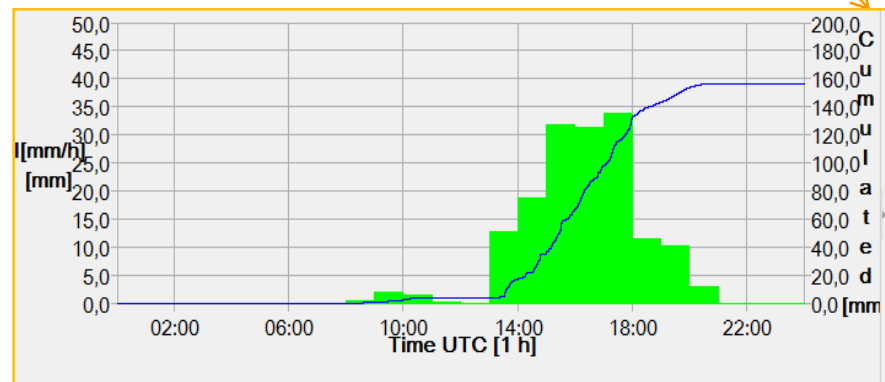
Monday the 24th: rain gauge data (mm/24h)



Collagna (Emilia) Lat 44,30 Lon 10,24



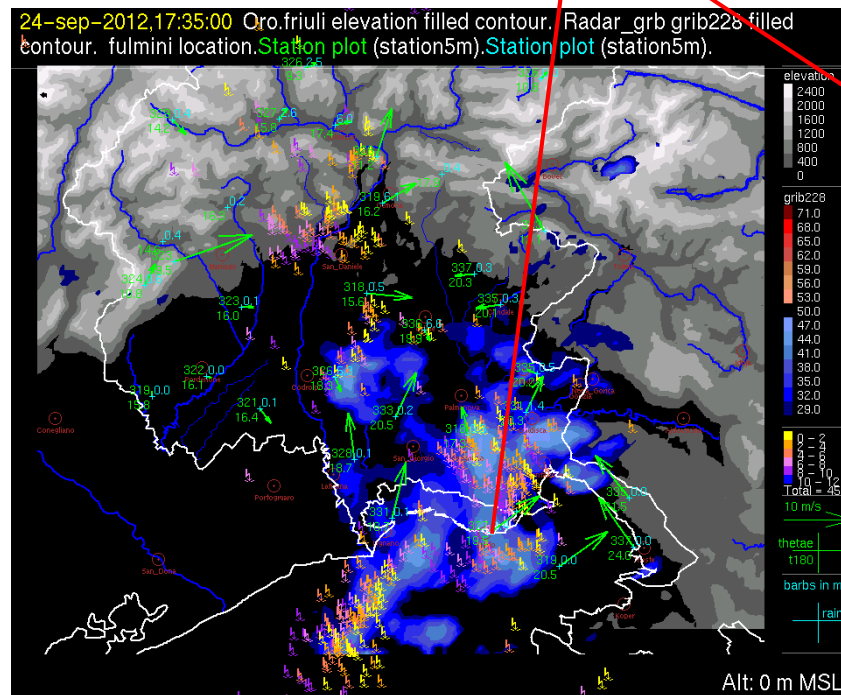
Cason di Lanza (Friuli) Lat 46,57 Lon 13,17



From L'Aquila Secondary Centre.

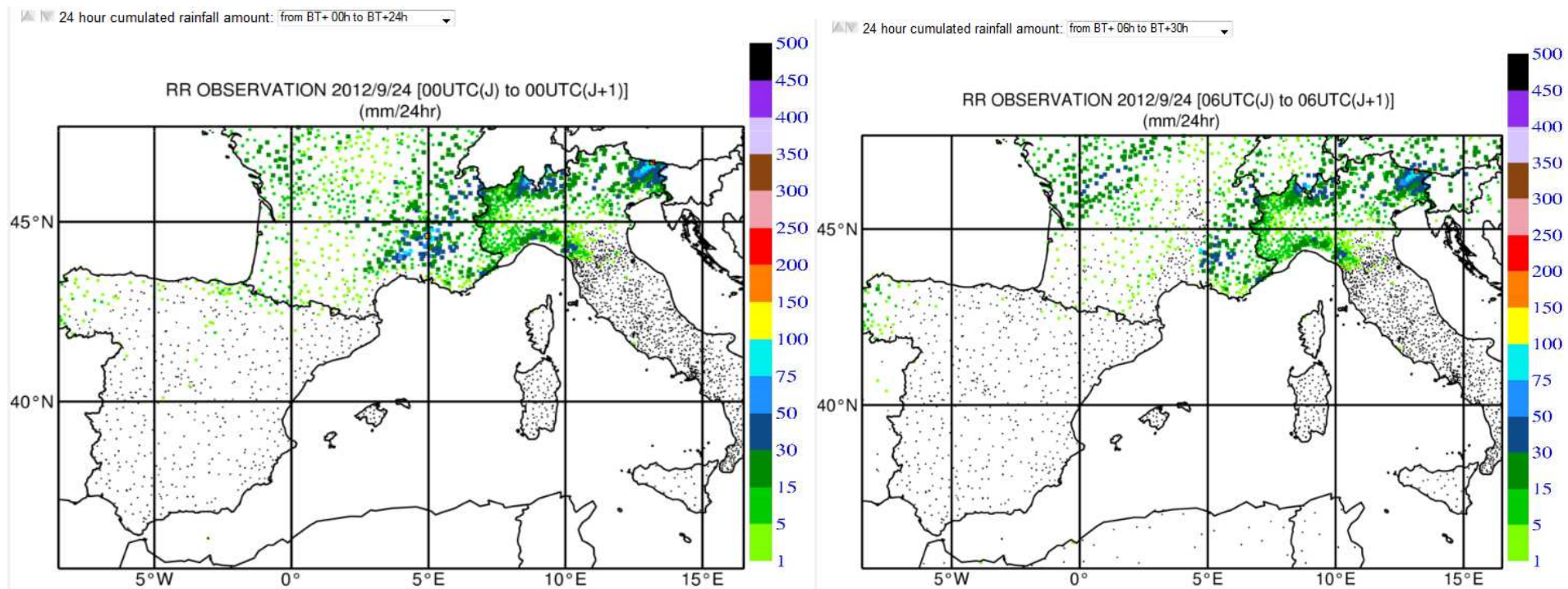
Damages

Uprooted trees along a road between Belvedere and Boscat di Grado (Friuli) due to strong wind gusts.
Damages to roof due to the wind were also reported

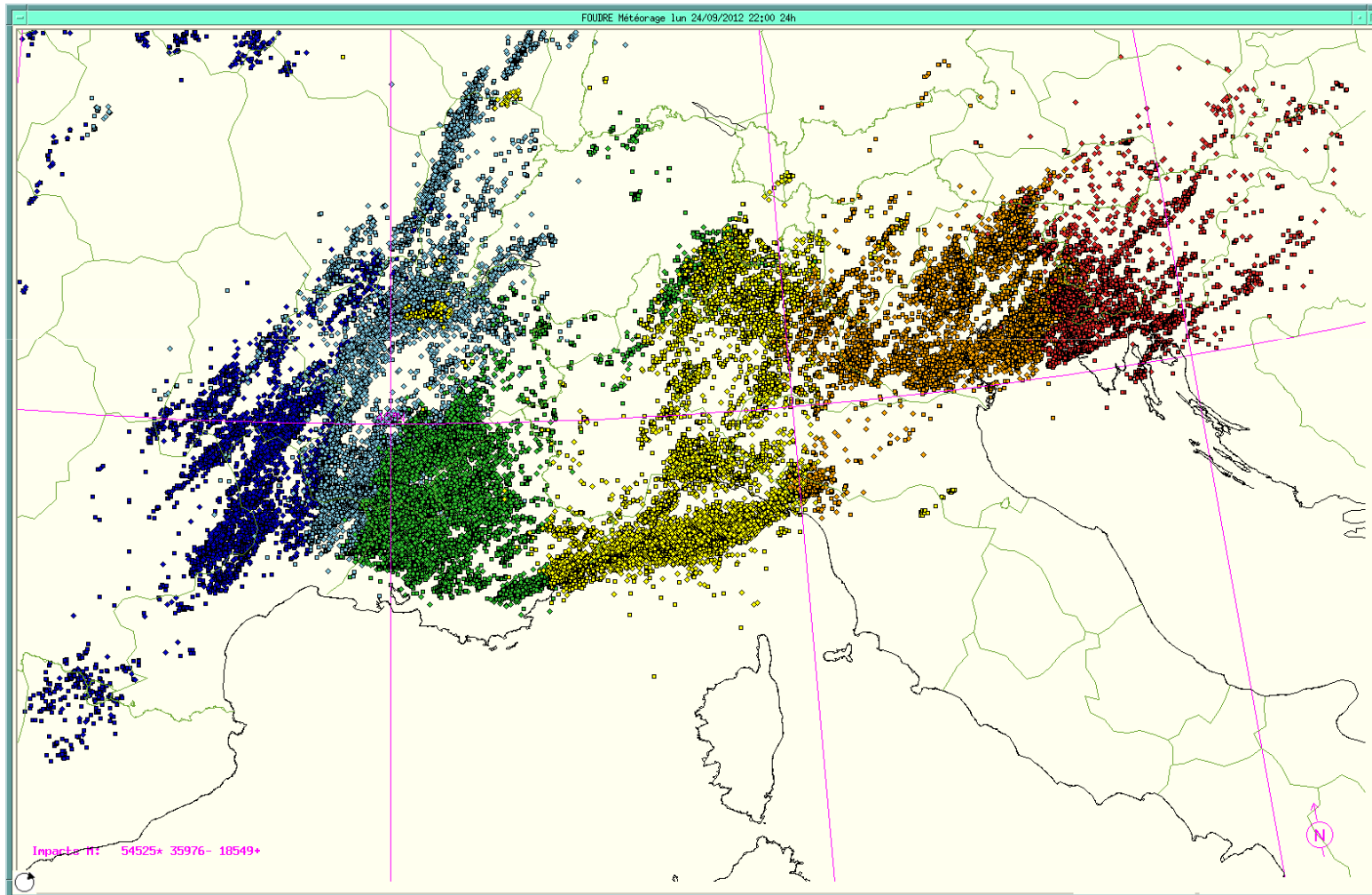


24hr cumulated rainfall amount

- Convective episode over CV with amounts of 50 up to 100 mm/24hr (Ardèche, Gard, Vaucluse et Drôme), most of the rain was recorded in ~6hr.



Lightning strikes for 24 September



EUCLID network

Home>Observations>Lightning>Euclid

Euclid, LMA, LINET, LLS Catalonia, ZEUS, UKMO, NOA, Meteorage, SAETTA,

EUCLID European Cooperation for Lightning Detection ⓘ

Site: **Native**, SOUTH-EUROPE,

Navigation: ⏪ ⏩ ⏸ ⏴ ⏵ 🗑️ 03h00 ▾

EUCLID network 5mn lightning : 2012-09-24 03:00

HyMeX

Sop1 Sop2

24 Sept

⏪ 2012 ⏩

1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 **24** 25 26 27 28 29
30

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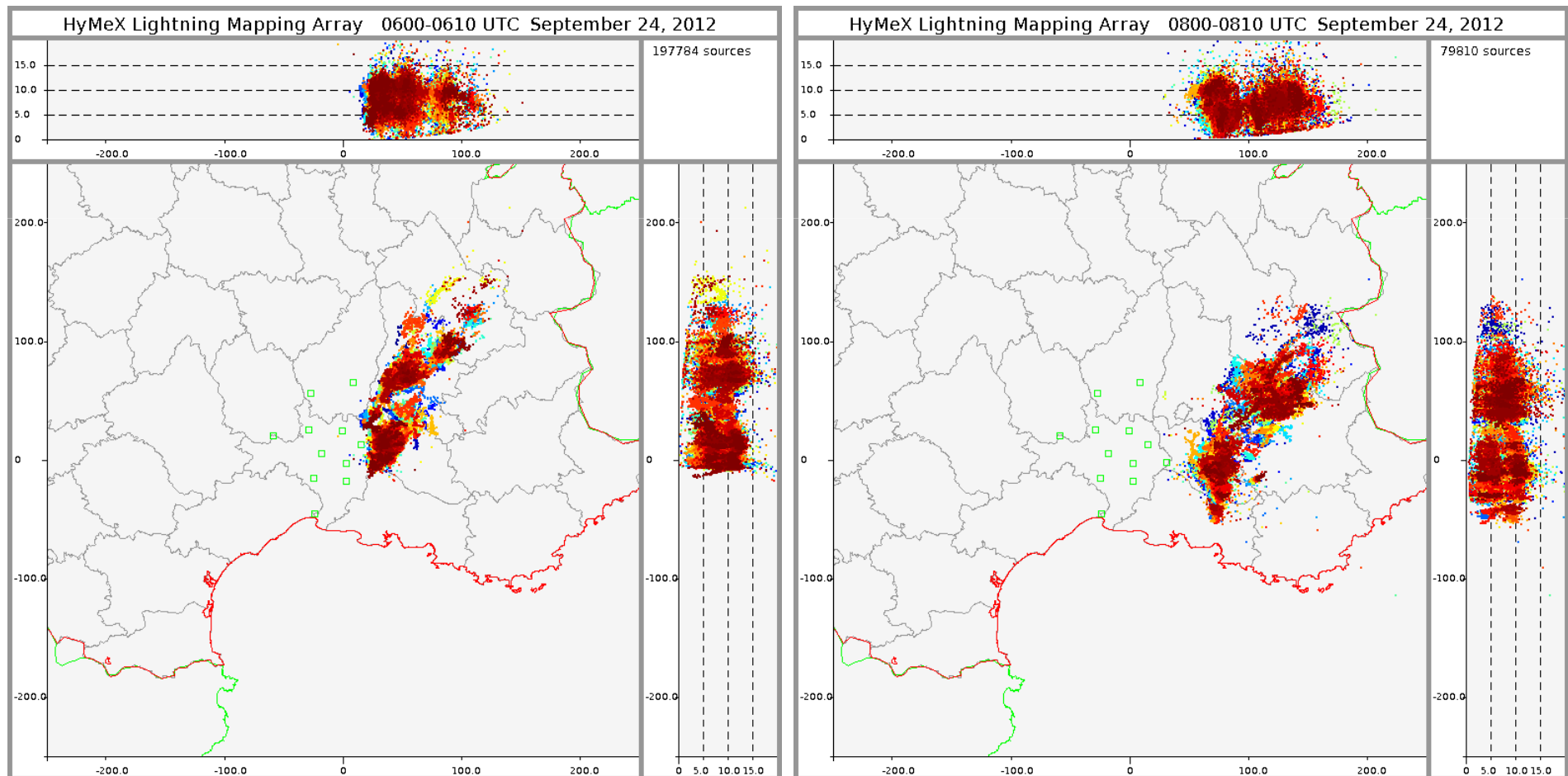
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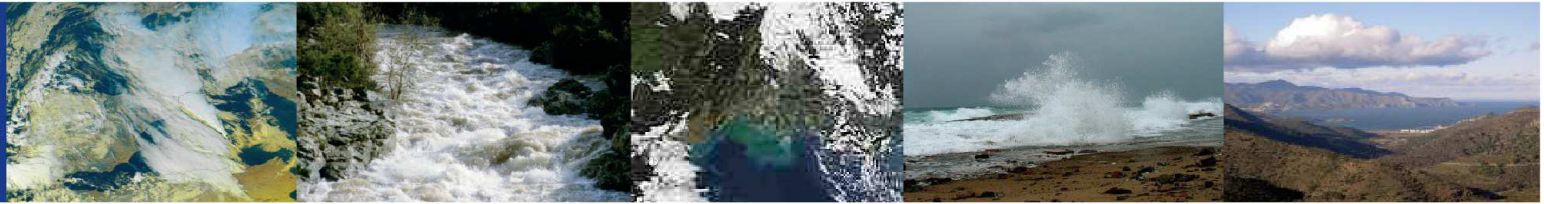
HyMeX

Lightning activity

Lightning Mapping Array (HyMeX)

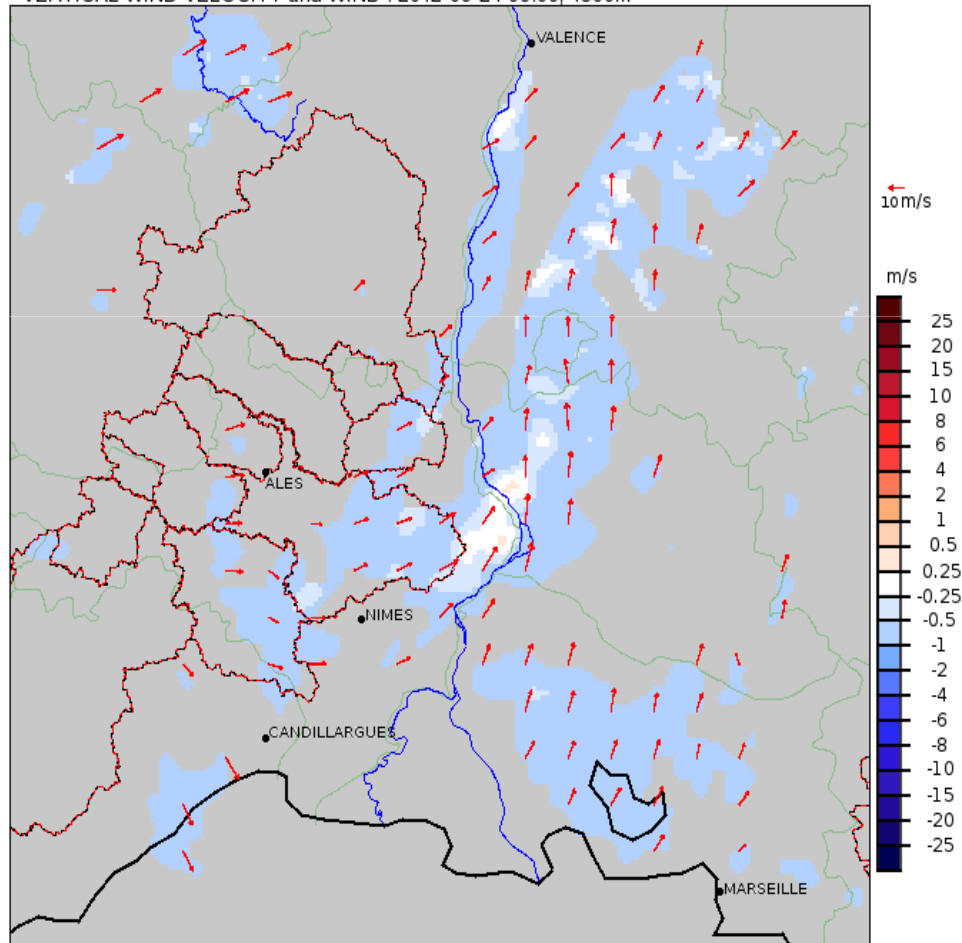


HyMeX

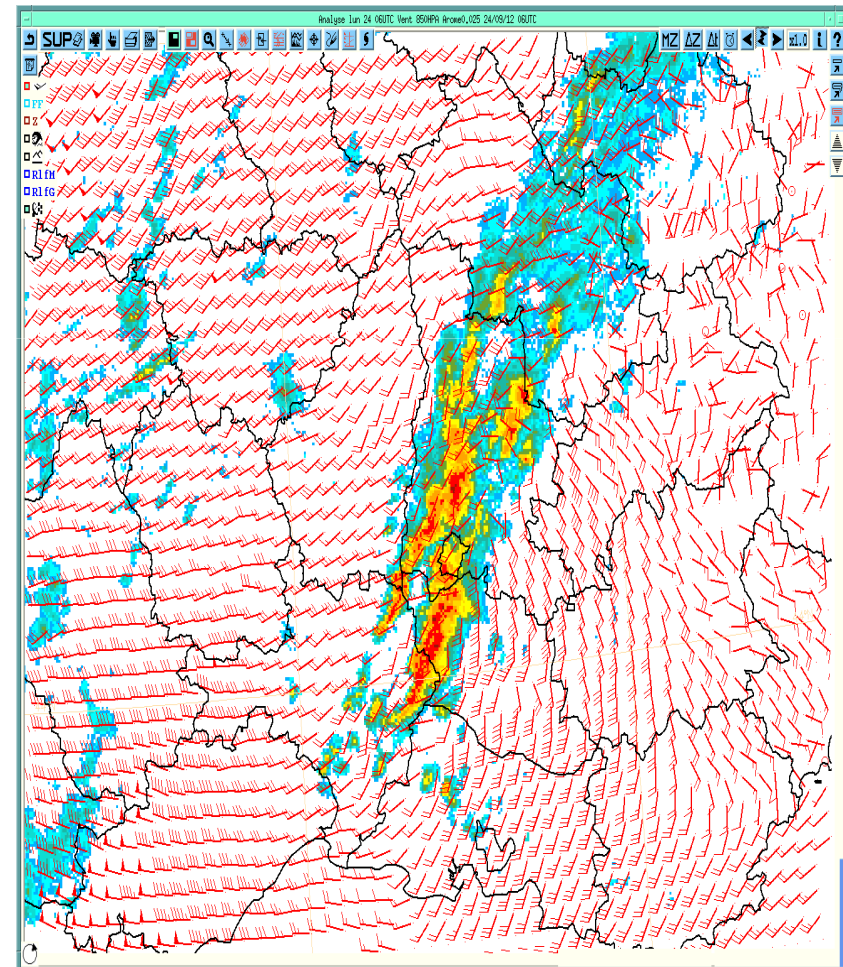


24/09/2012 – 06UTC: wind field, 850hPa

VERTICAL WIND VELOCITY and WIND : 2012-09-24 06:00, 1500m

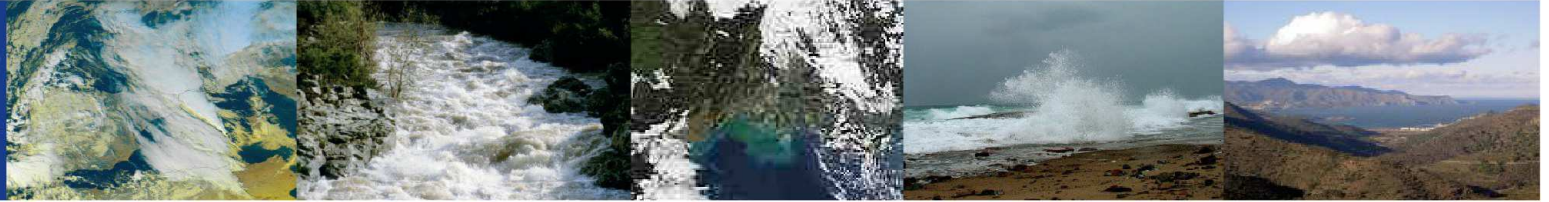


Radar wind retrieval



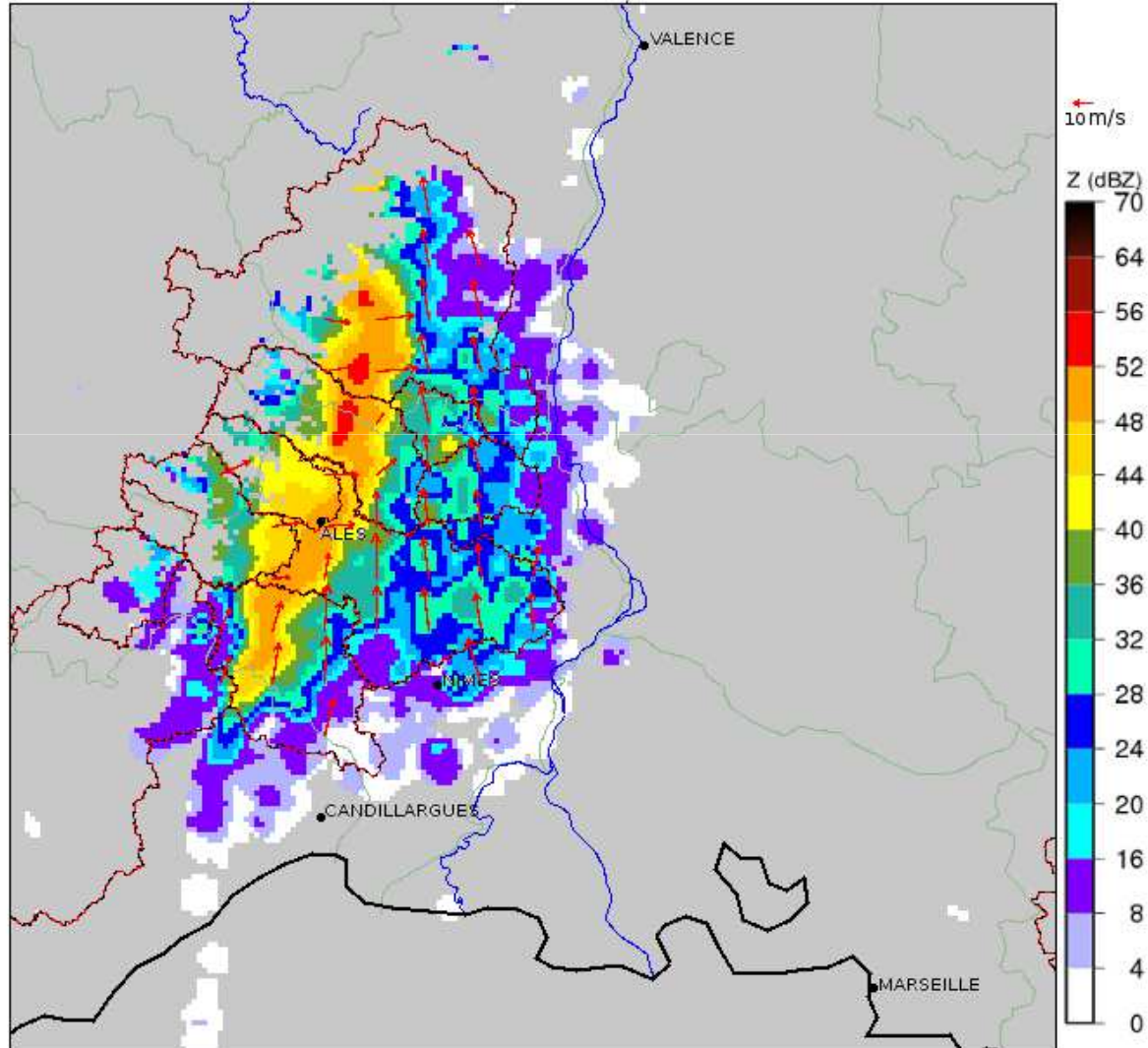
AROME_FRANCE analysis

HyMeX

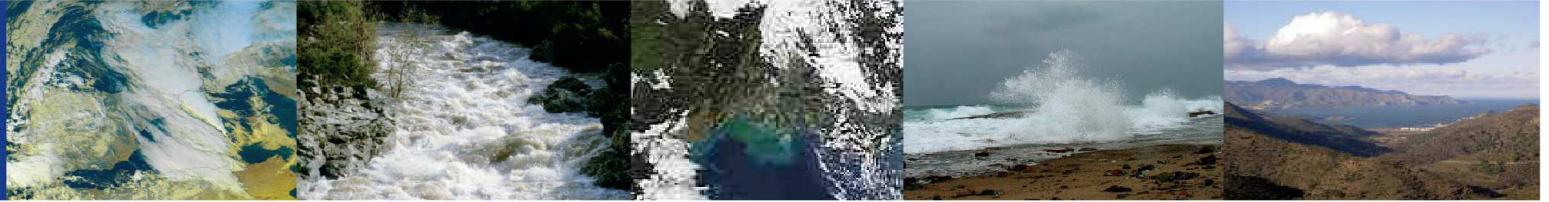


3D radar
(Nîmes)

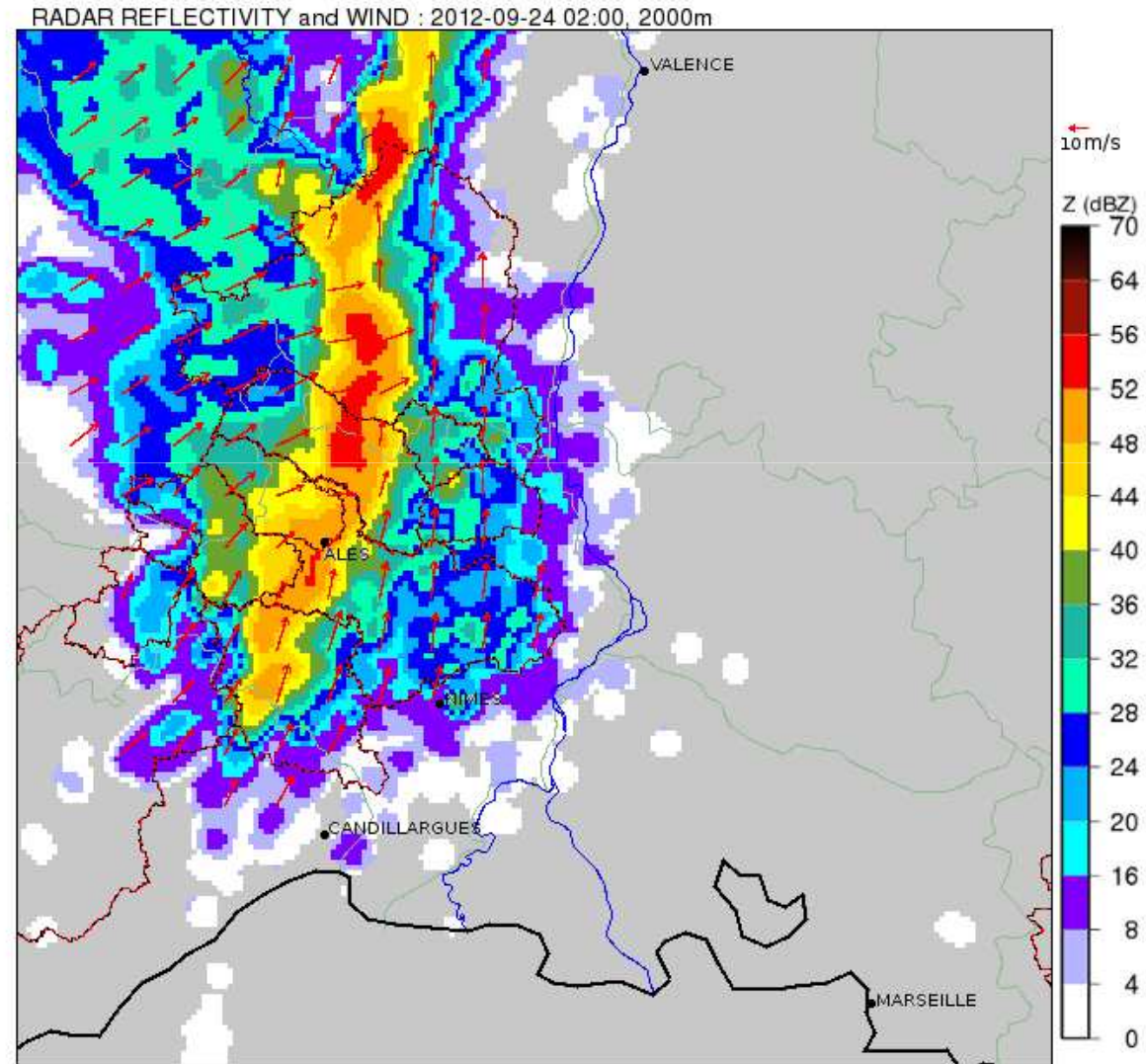
RADAR REFLECTIVITY and WIND : 2012-09-24 02:00, 500m



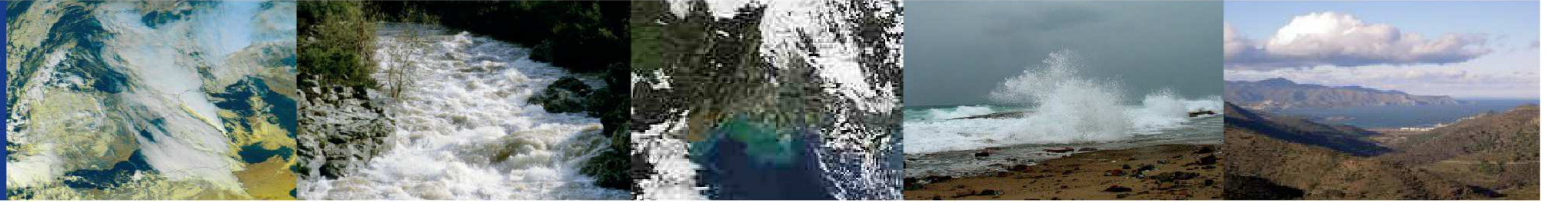
HyMeX



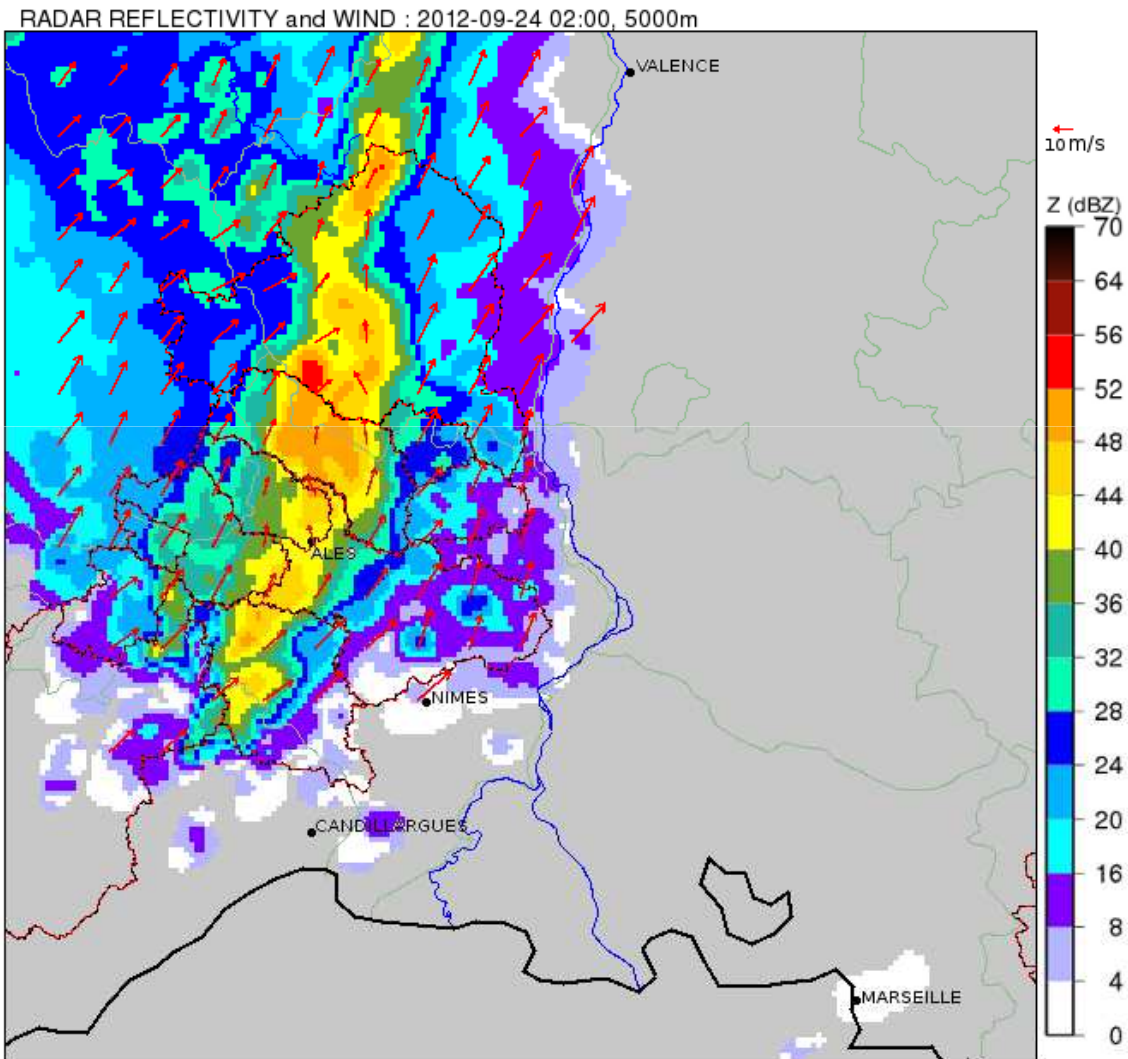
3D radar
(Nîmes)



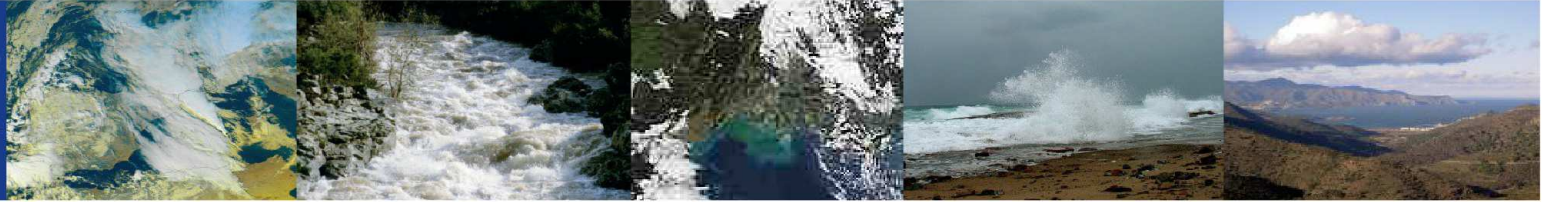
HyMeX



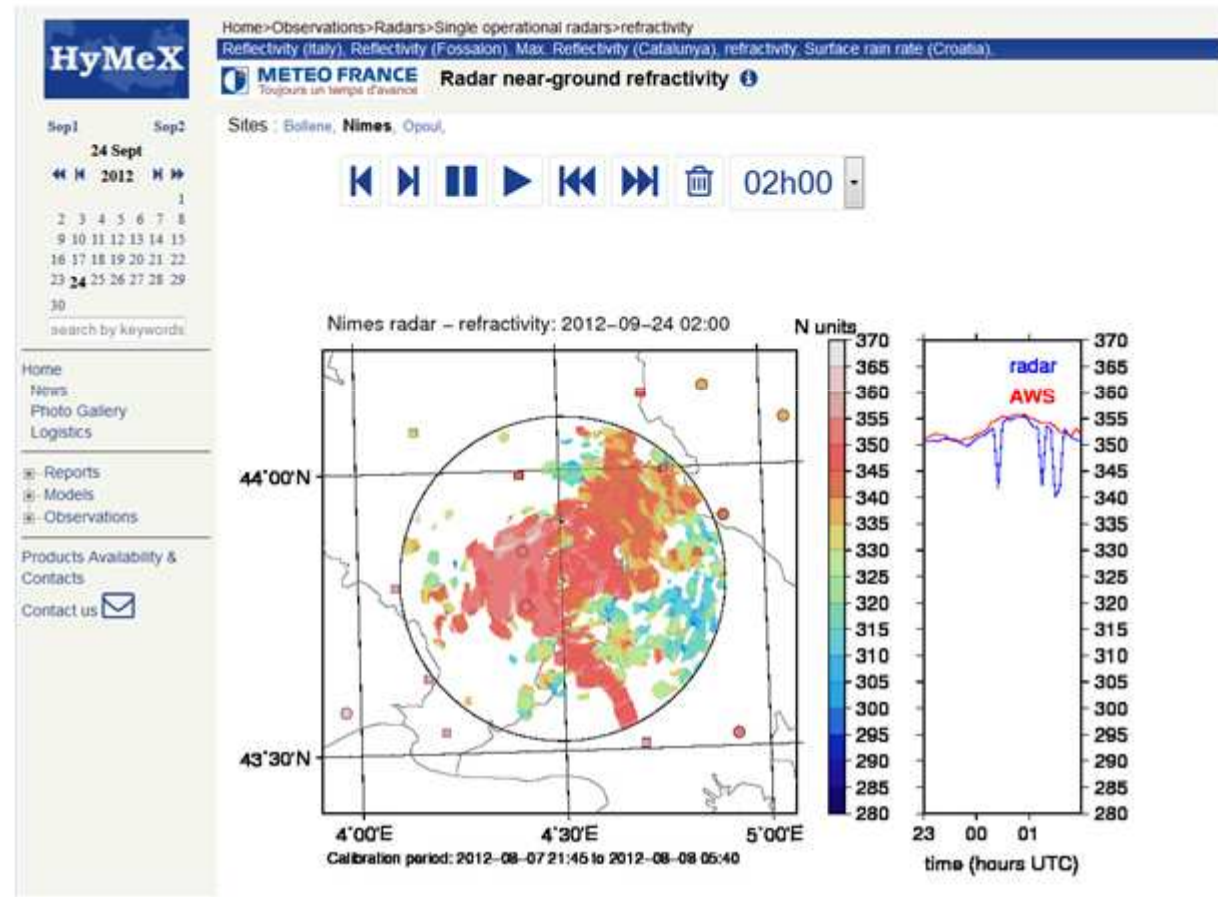
3D radar
(Nîmes)



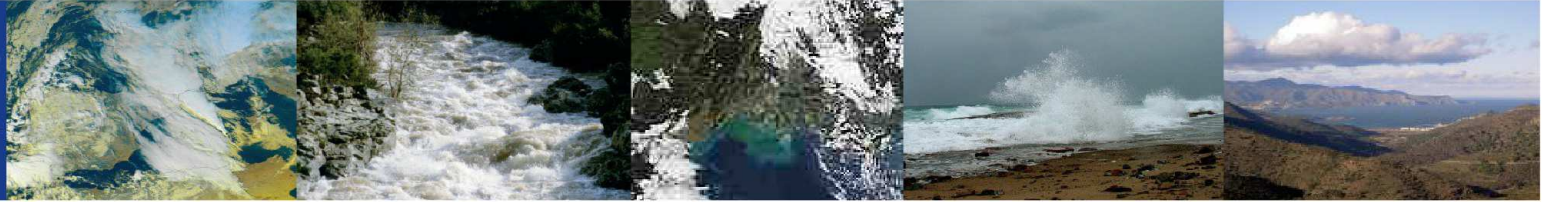
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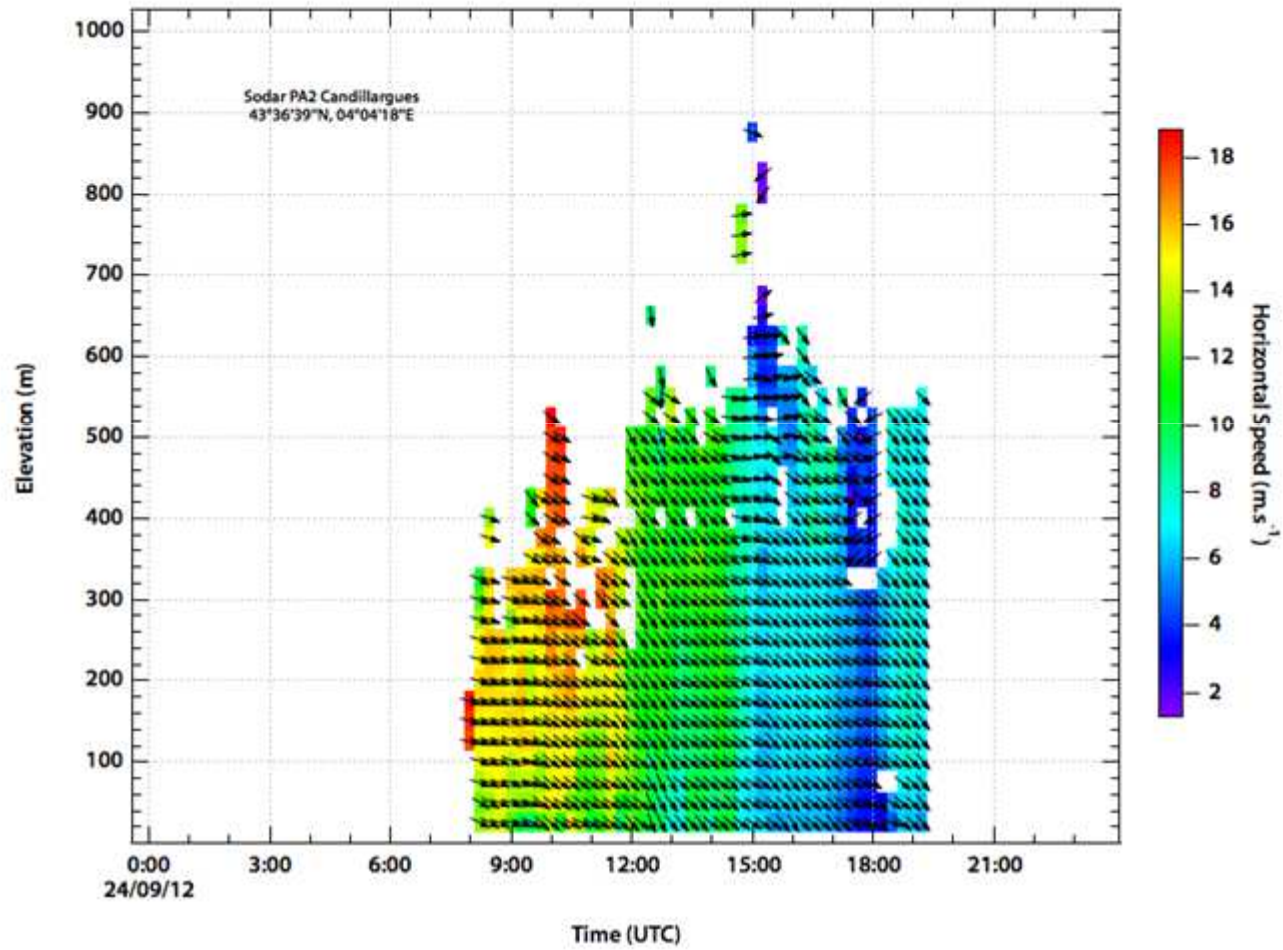
Radar refractivity
(proxy for humidity)

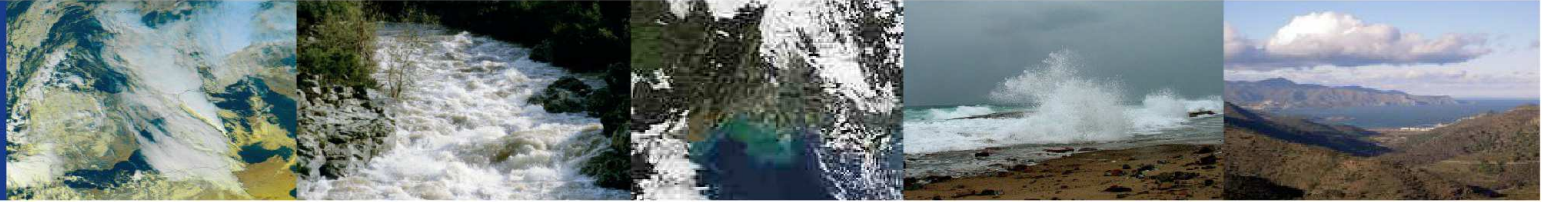


HyMeX

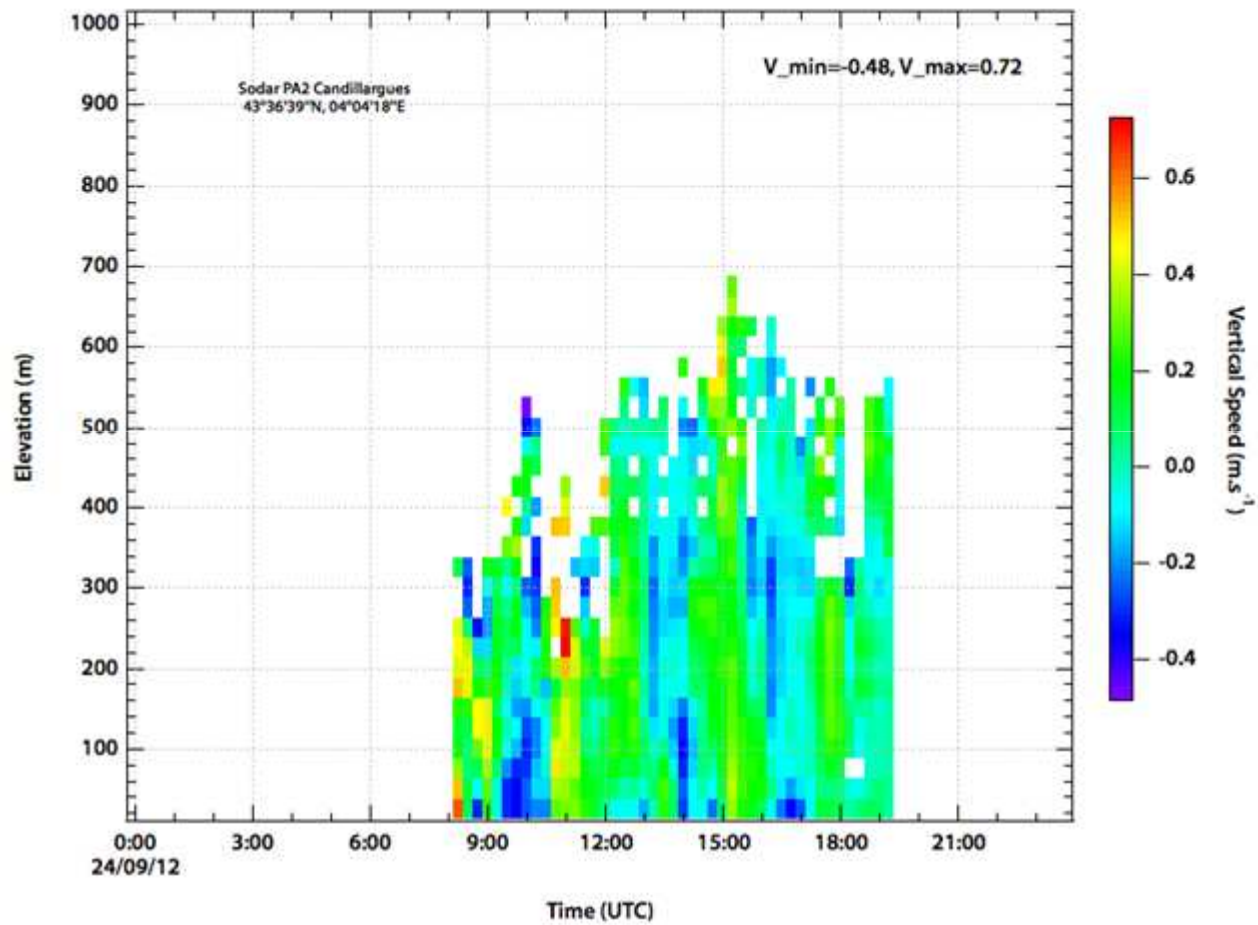


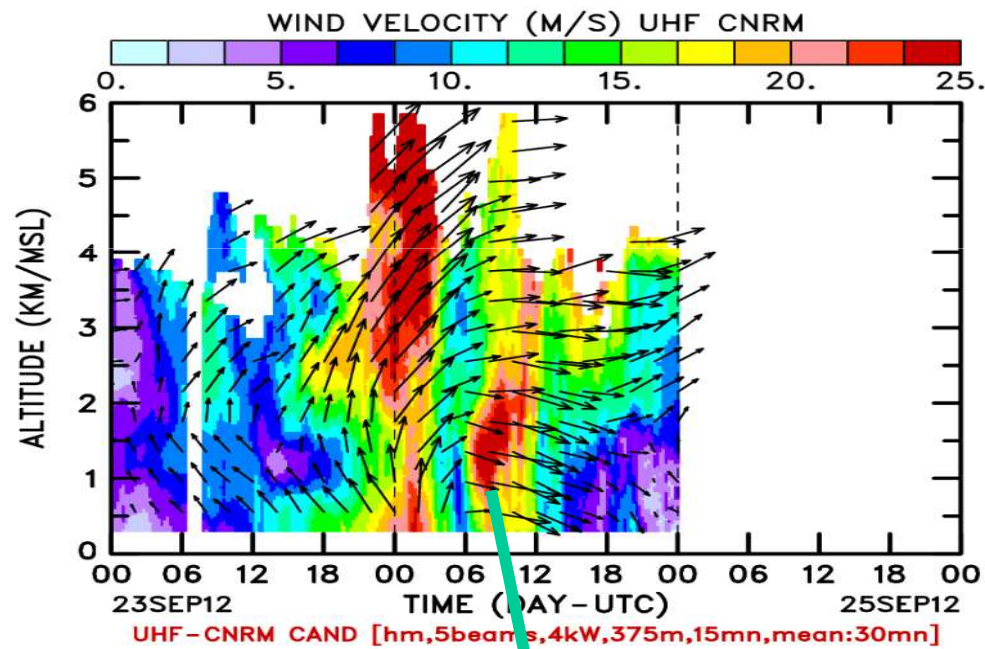
Sodar



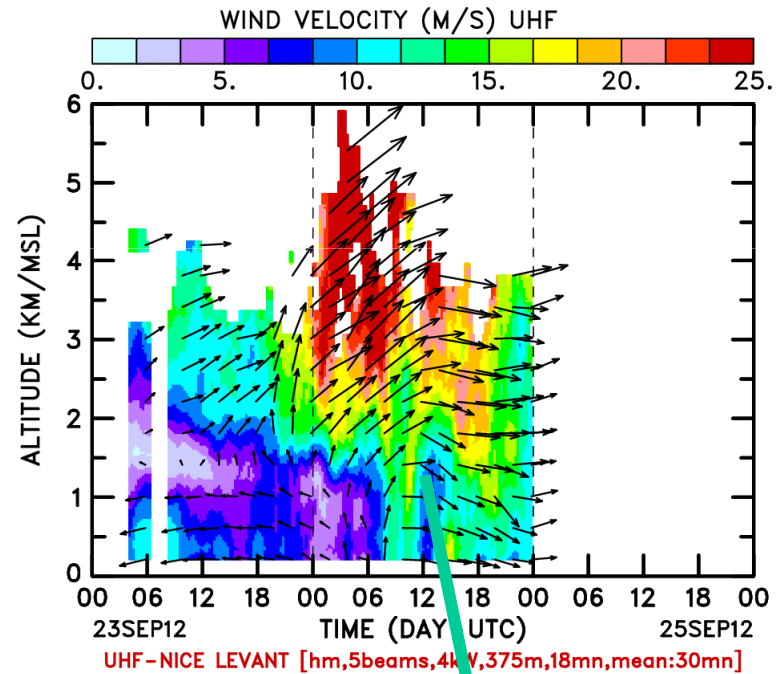


Sodar





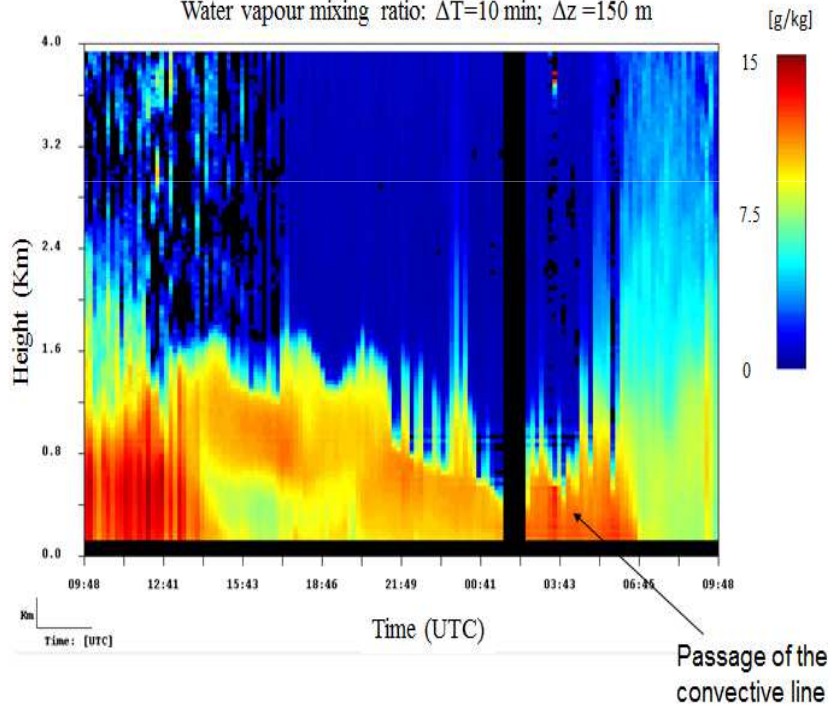
Front signature at **Candillargues**
(wind rotation, velocity increase)



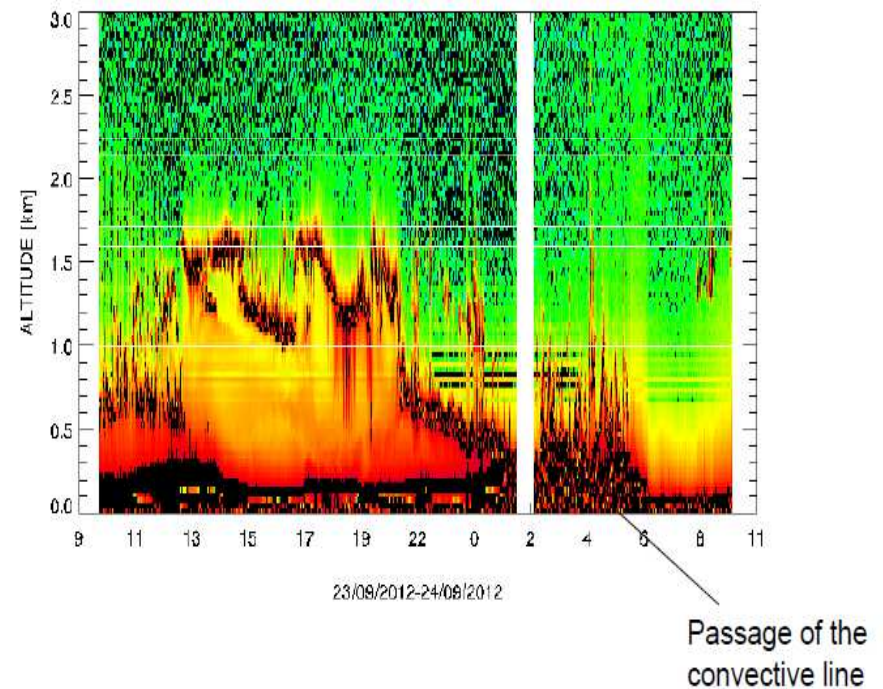
Front signature at **Ile du Levant**
(wind rotation, velocity increase)

23-24/09/2012: LIDAR – BASIL results

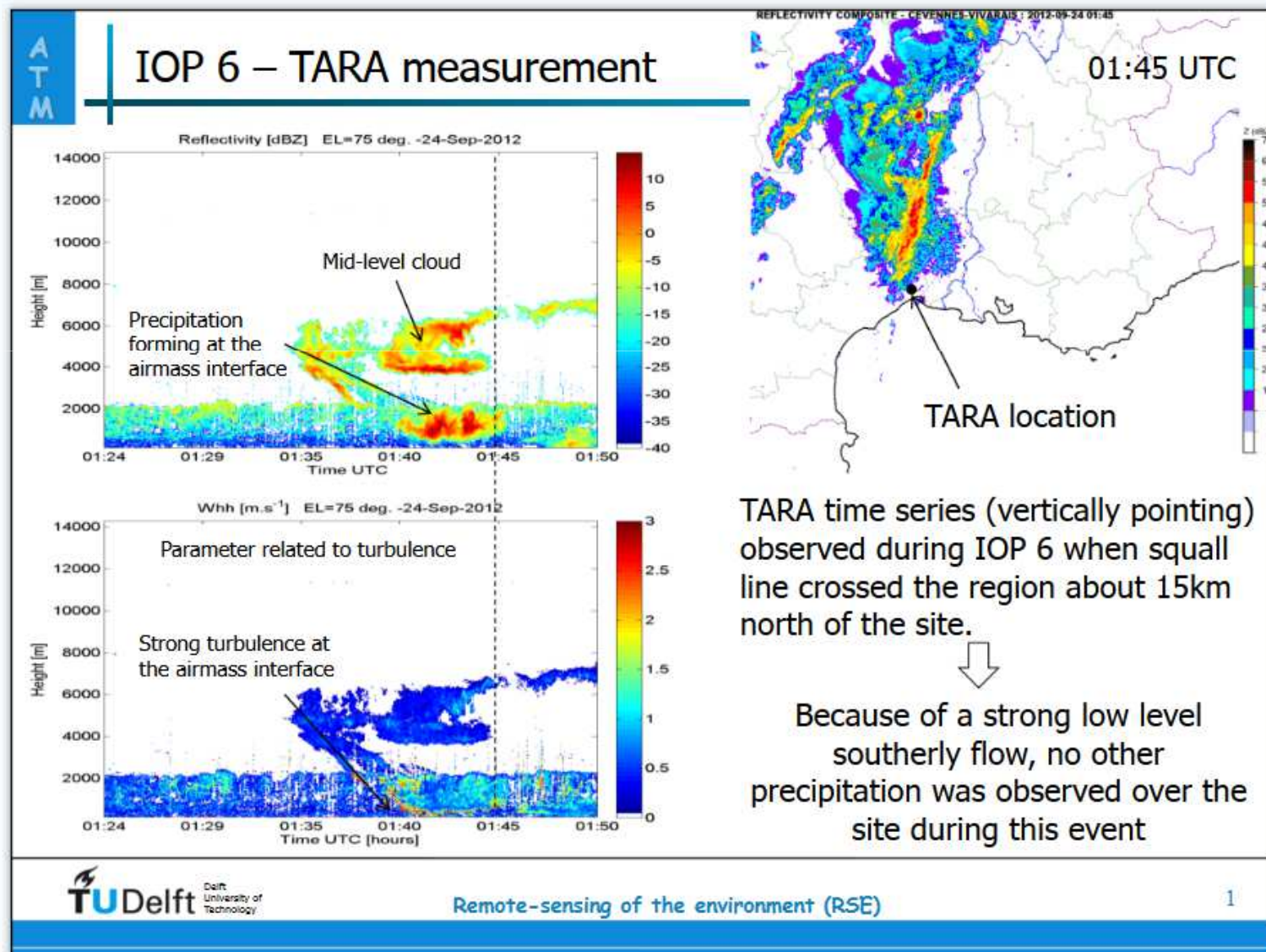
VERY PRELIMINARY RESULTS
 BASIL, Candillargues, 43°36'40.10"N ; 4° 4'15.80"E
 23-24 September 2012 analog
 Water vapour mixing ratio: $\Delta T=10$ min; $\Delta z=150$ m



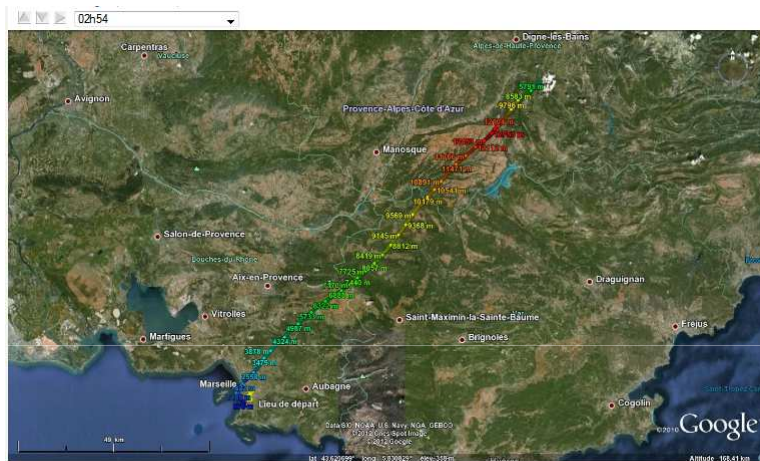
IOP 6 - VERY PRELIMINARY RESULTS
 BASIL, Candillargues, 43°36'40.10"N ; 4° 4'15.80"E
 23-24 September 2012
 Lidar reflectivity at 1064 nm: $\Delta T=1$ min; $\Delta z=30$ m



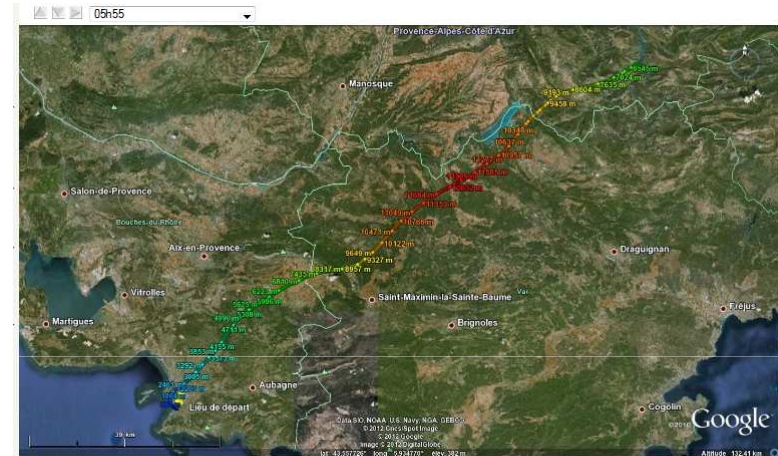
Cloud radar TARA in Candillargues



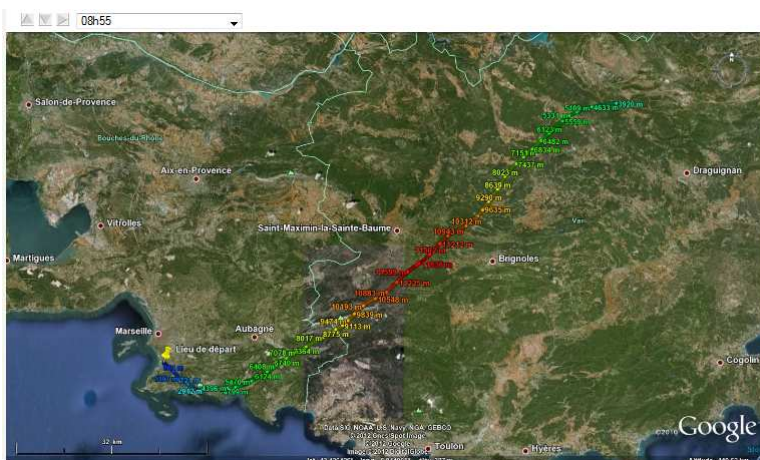
24/09/2012:4M RS at Marseille (Vaisala RS92) RS balloon trajectory shifting southward with time



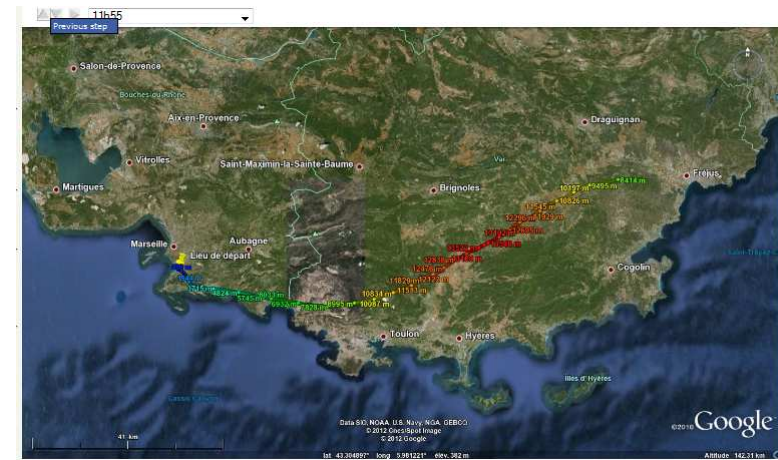
Launch time = 02.54UTC



Launch time = 05.55UTC

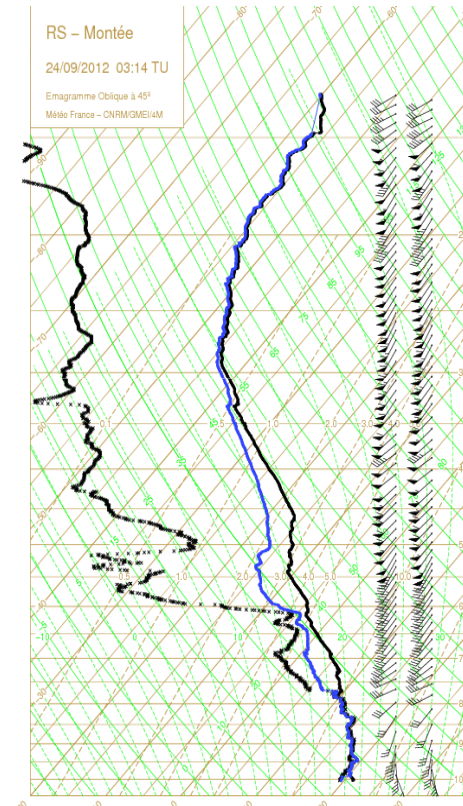
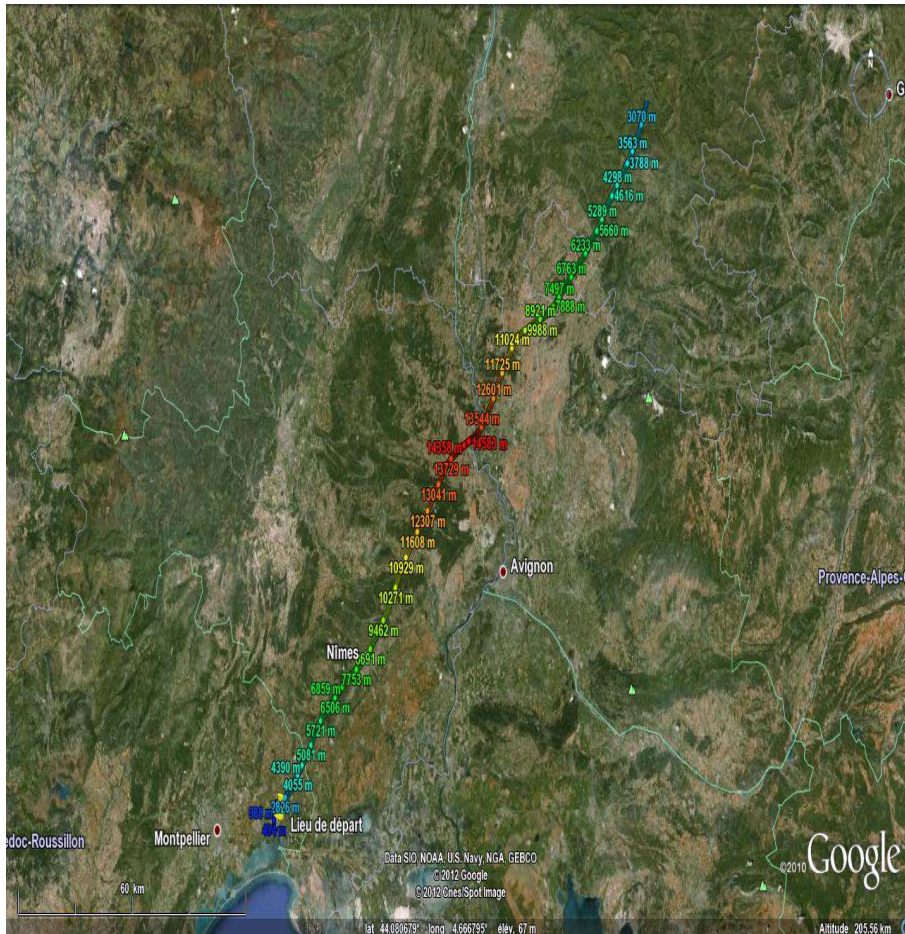


Launch time = 08.55UTC

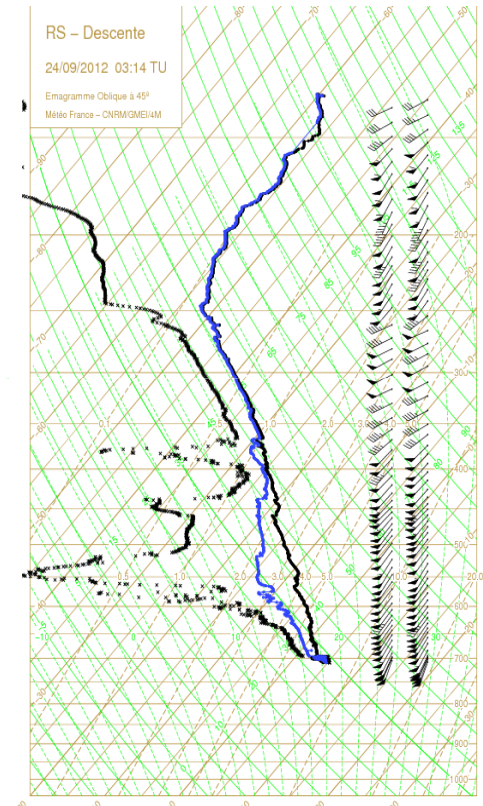


Launch time = 11.55UTC

24/09/2012:4M RS at Candillargues (Vaisala RS92)



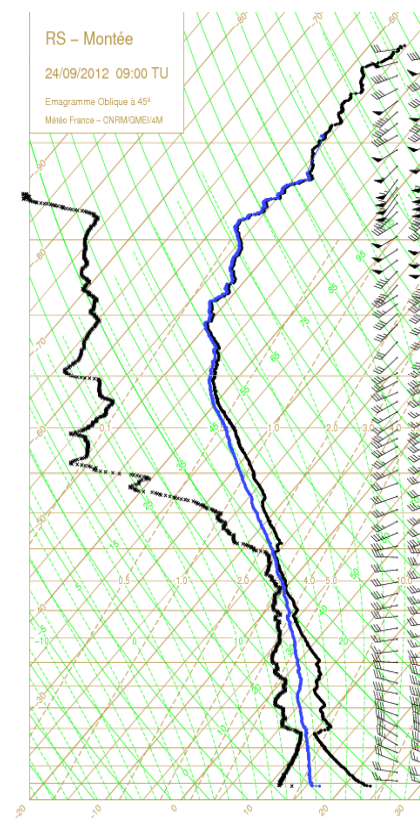
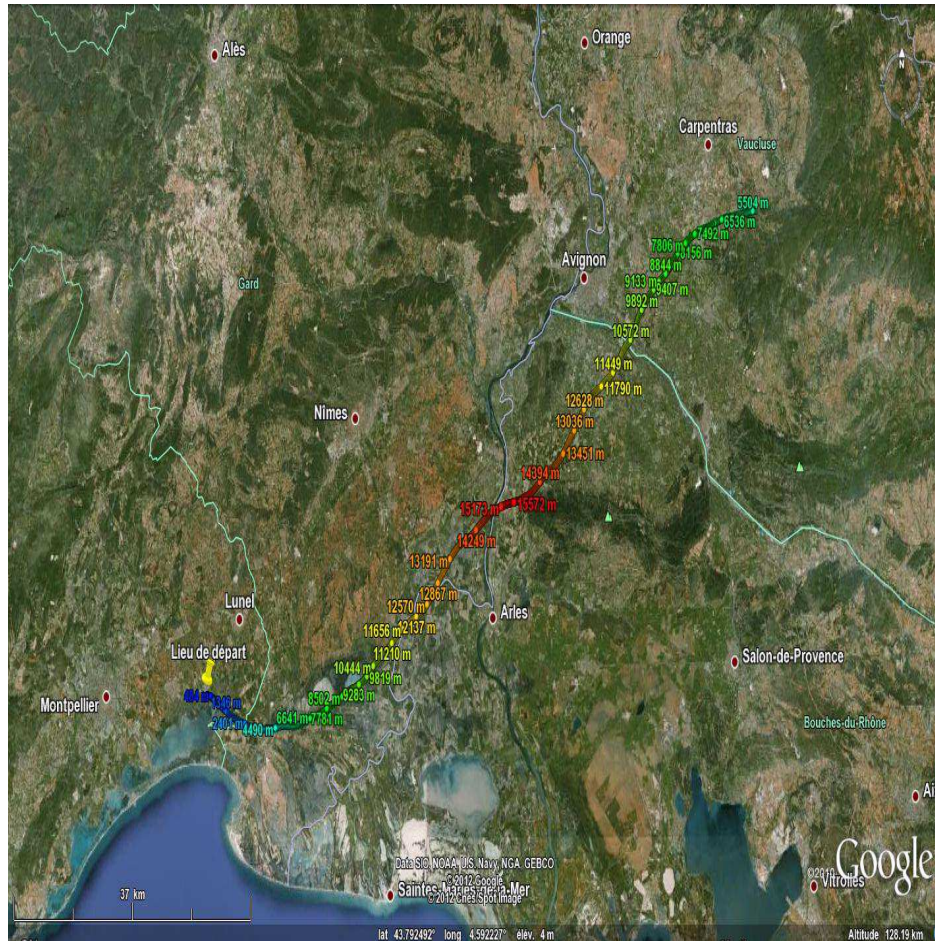
ascent



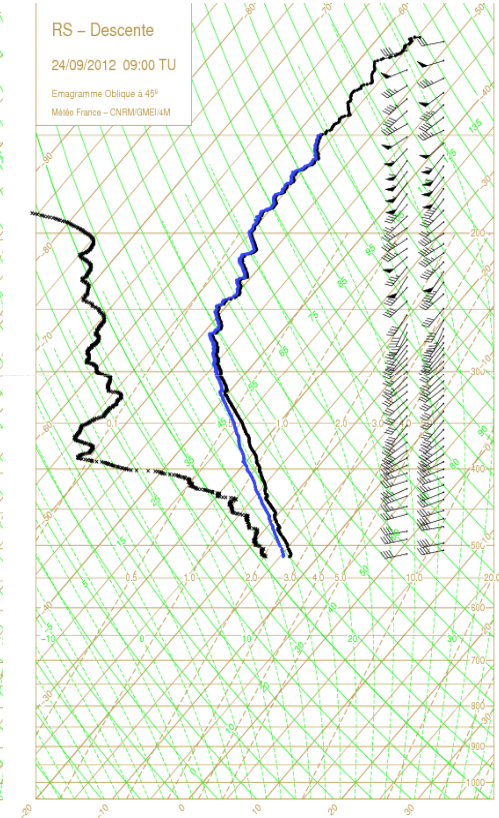
descent

Launch time: 03UTC

24/09/2012:4M RS at Candillargues (Vaisala RS92)



ascent



descent

Launch time: 09UTC

24/09/2012: BAMED flight #19

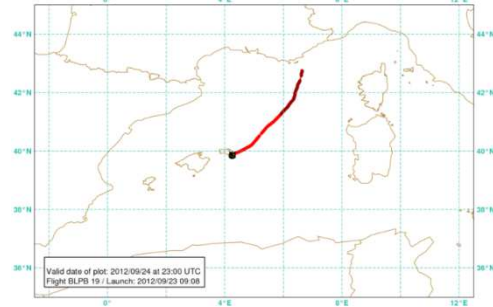
Observations of the Bound. Layer Press. Balloons.

Parameters, Positions.

Vol: 19

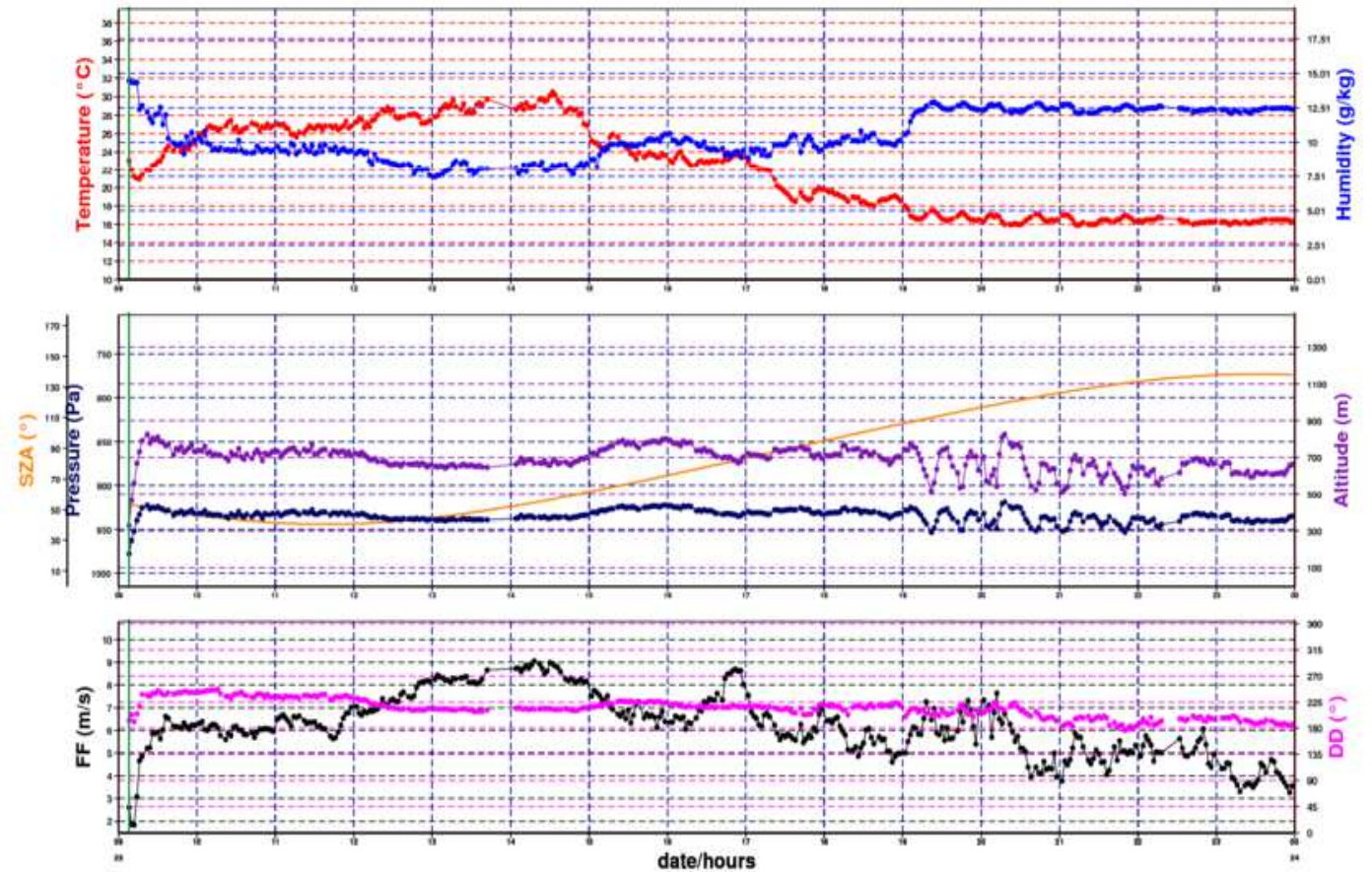
date: 23H

BLPB 19



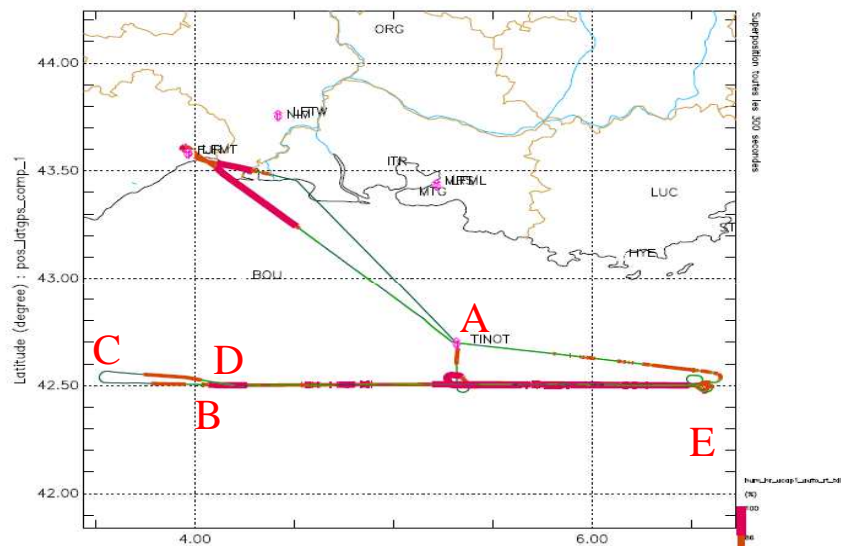
Boundary Lay. Press. Balloon. Flight Nb. 19
 Valid date of plot: 2012/09/24 at 00:00 UTC
 Start date: 2012/09/23 09:11 / Launch date: 2012/09/23 09:08

Temperature from South Pole Sensor



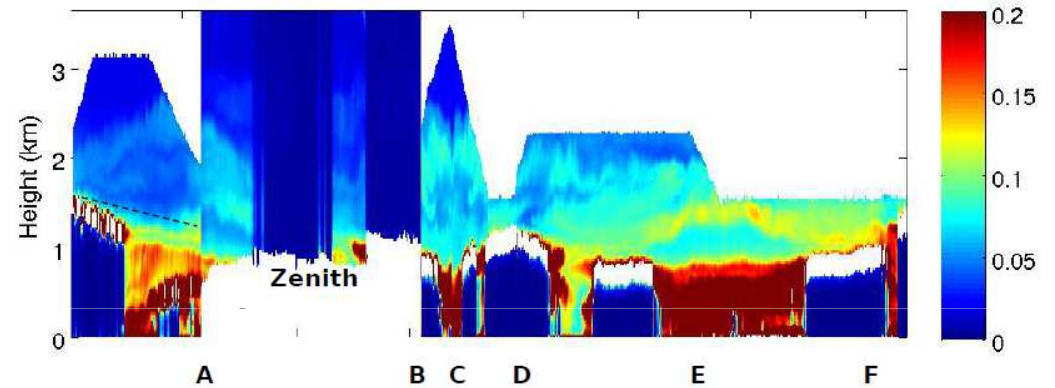
23/09/2012: ATR flight and LEANDRE2 observations

Campagne HYMEX
ATR42 as120039 du 23/09/2012
de 14h12m20 a 17h17m40 UTC

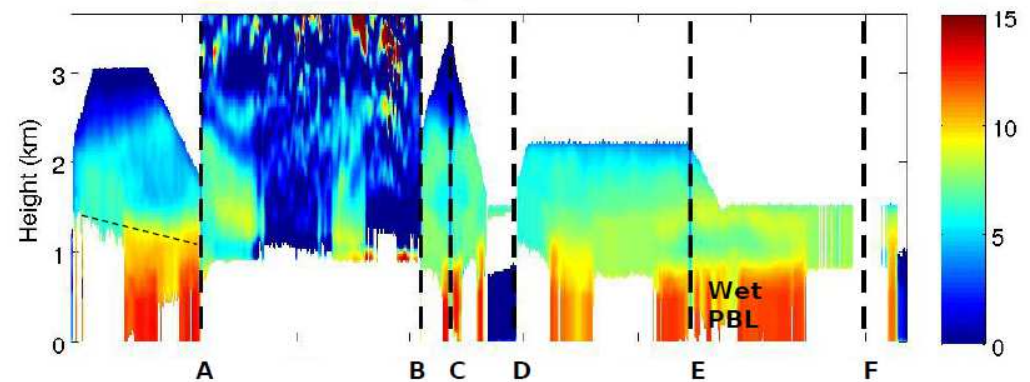


@ D. Bruneau

HyMeX - LEANDRE 2: Backscatter profile: VOL39



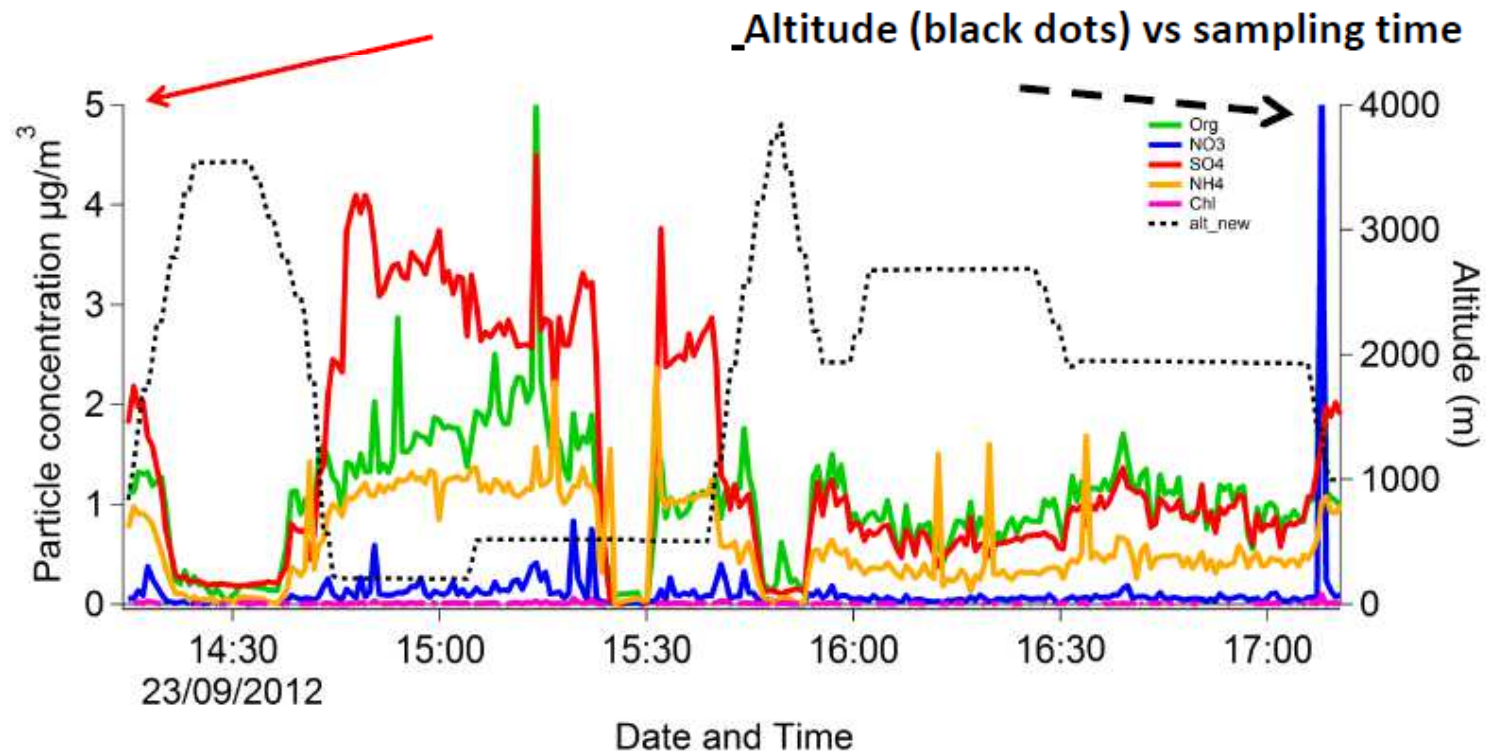
HyMeX - LEANDRE 2: H₂O mixing ratio (g/kg): VOL39



View from last leg (direction SW)

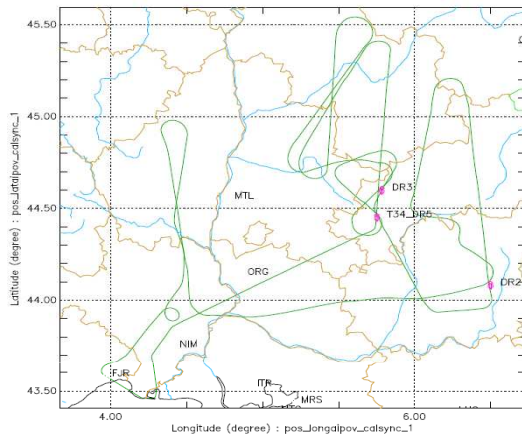
High concentrations at low altitudes:
-high fraction of **SO₄ (red)** and **Org (green)**. Typical of clean background airmasses

Particle mass concentration vs sampling time
Coloured by aerosol composition



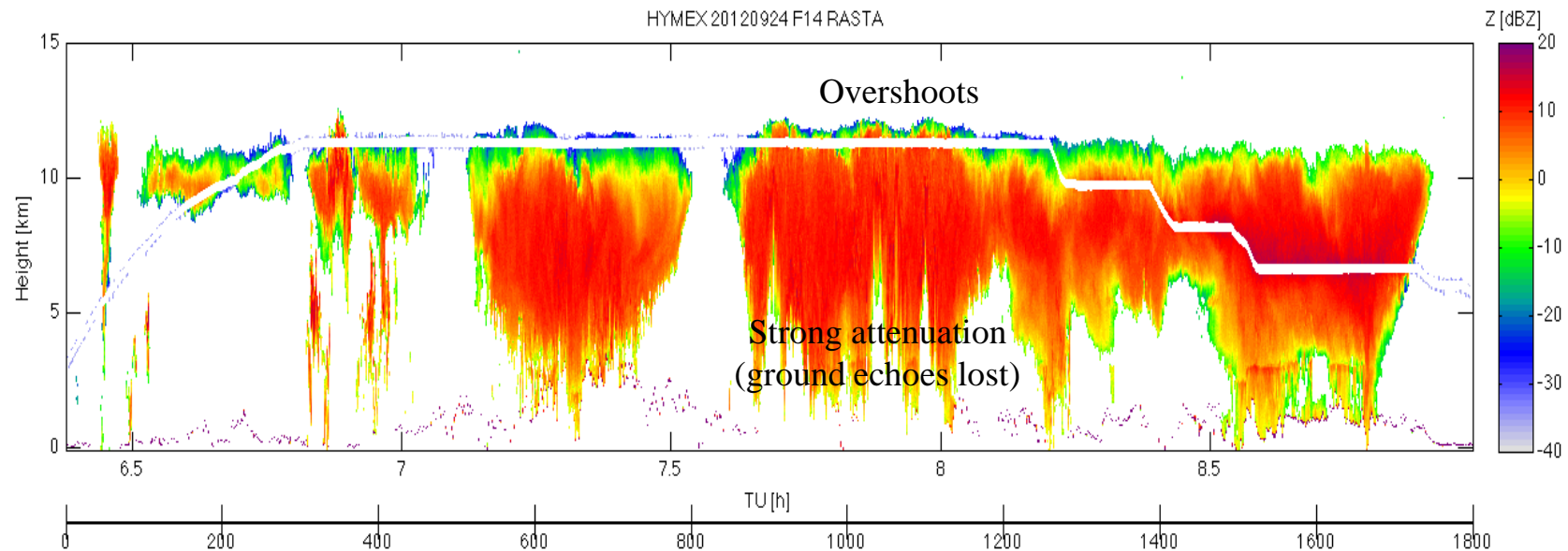
24/09/2012:FALCON-20 flight

Campagne HYMEX
M20 fs120014 du 24/09/2012
de 06h18m21 a 09h17m21 UTC



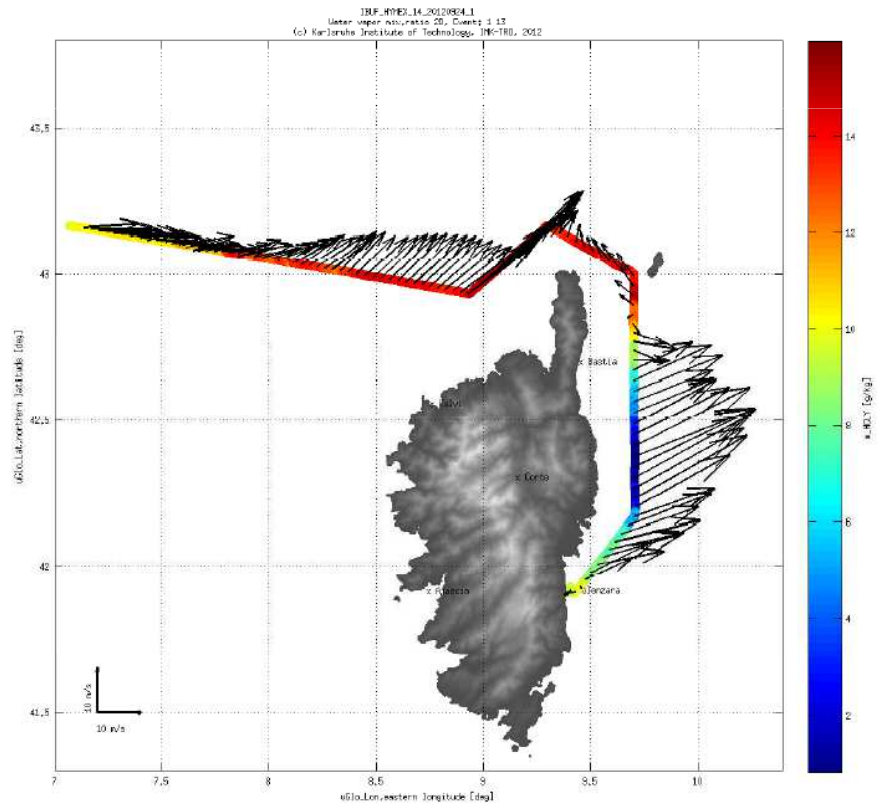
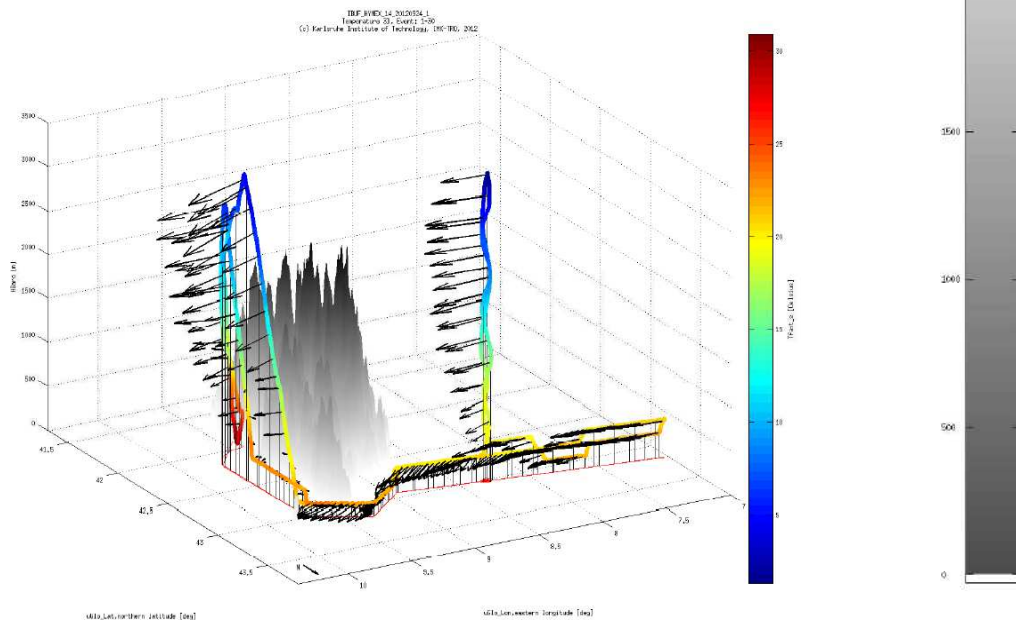
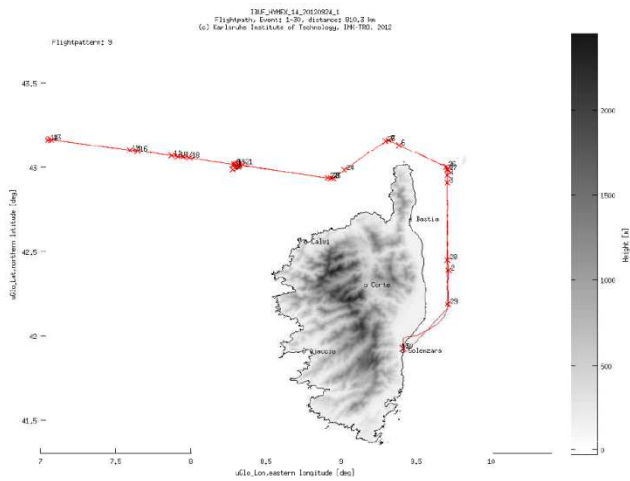
3 **dropsondes** successfully launched (over 5)

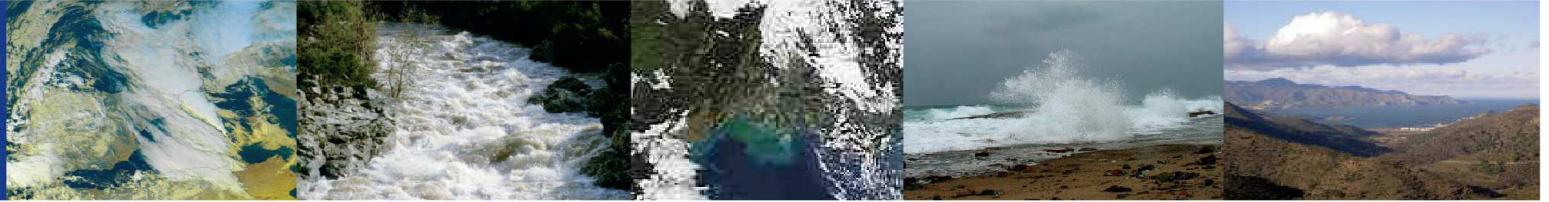
RASTA cloud radar on board



24/09/2012:Dornier flight

Flight pattern #9a
12-16UTC





Contribution of convection-permitting models

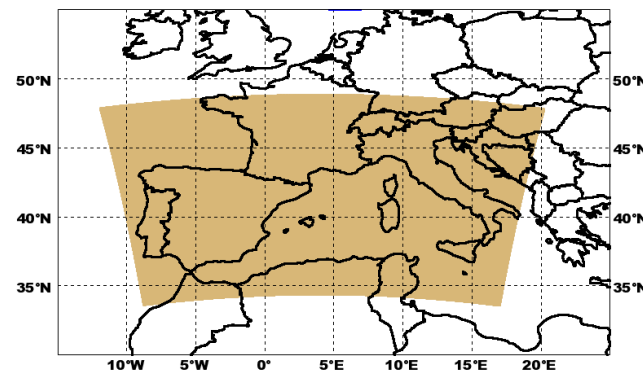
at very short ranges :

Deterministic approach with

AROME-France (+30h) vs AROME-WMed (+48h) :

[23/00 UTC run vs 24/00 UTC run]

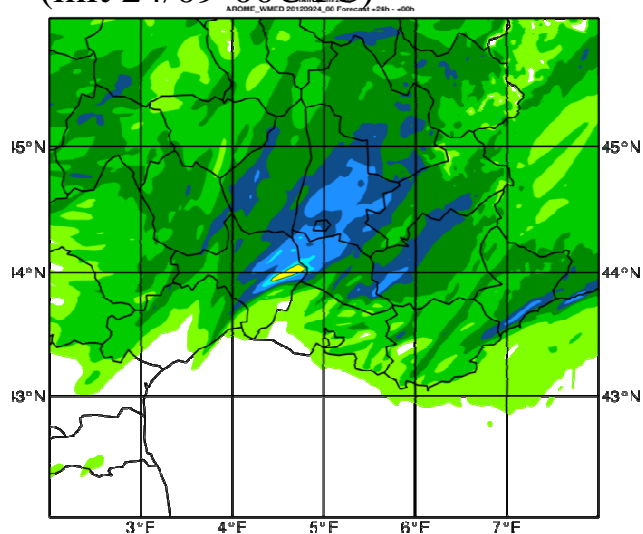
AROME-WED AREA :



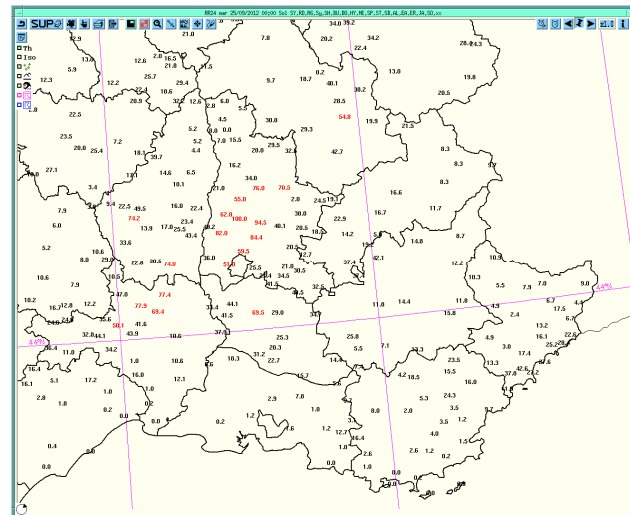
24hr cumulated rainfall amount

- Convective episode over CV with amounts of 50 to 100 mm/24hr (Ardèche, Gard, Vaucluse et Drôme), most of the rain was recorded in ~6hr.
- AROME_FRANCE gives a maximum rainfall over Drome (>75mm/24hr), while AROME_WMED gives > 100mm/24hr over the Gard departement
- Observed maximum is 100mm/24hr over Drome

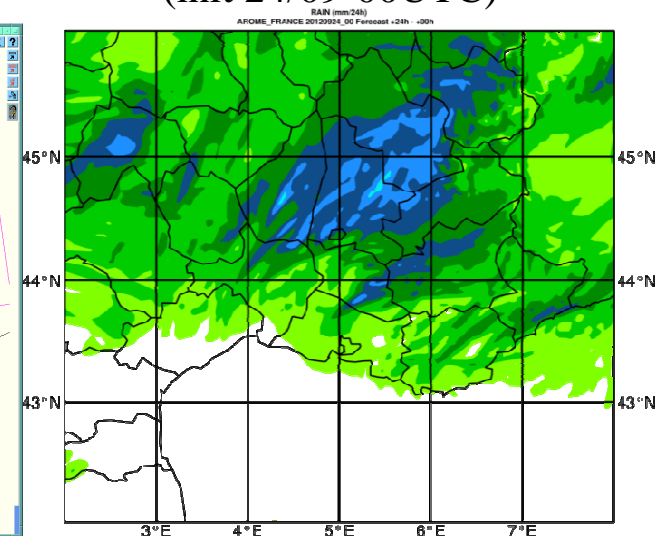
AROME_WMED
24hr cum. Rainfall
24 September 2012
(init 24/09-00UTC)



OBSERVATIONS
24hr cum. Rainfall
24 September 2012



AROME_FRANCE
24hr cum. Rainfall
24 September 2012
(init 24/09-00UTC)

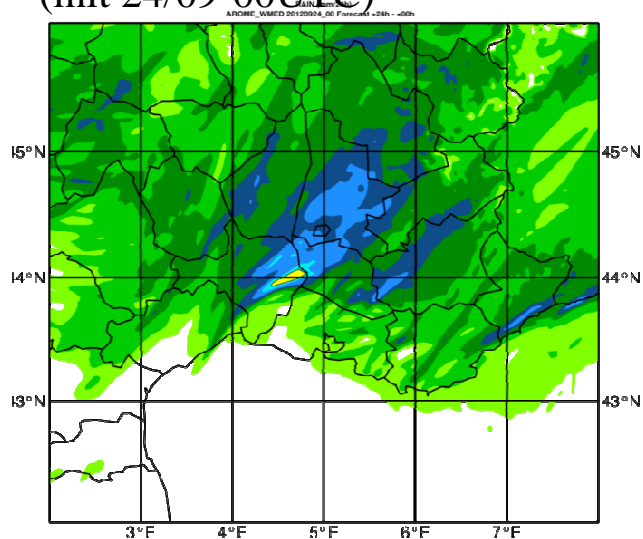


24hr cumulated rainfall amount

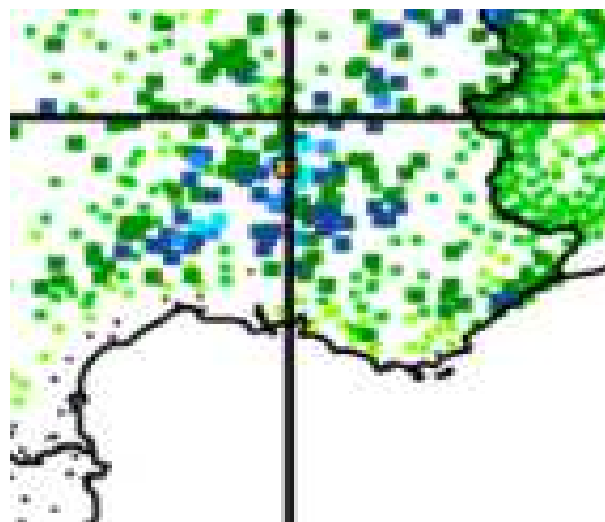
- AROME_WMED forecast initialized on init 23/09-00UTC was quite correct



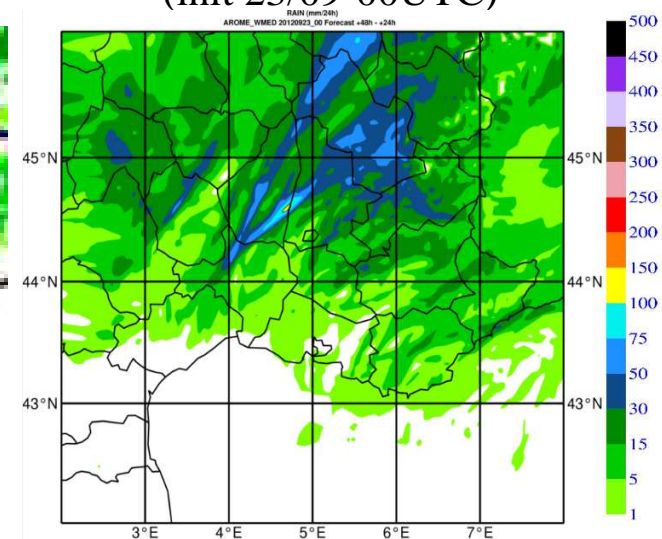
AROME_WMED
24hr cum. Rainfall
24 September 2012
(init 24/09-00UTC)



OBSERVATIONS
24hr cum. Rainfall
24 September 2012



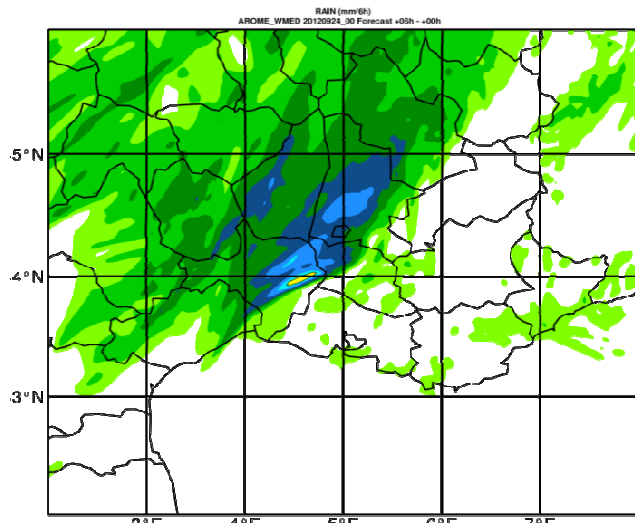
AROME_WMED
24hr cum. Rainfall
24 September 2012
(init 23/09-00UTC)



6hr cumulated rainfall amount (00-06UTC)

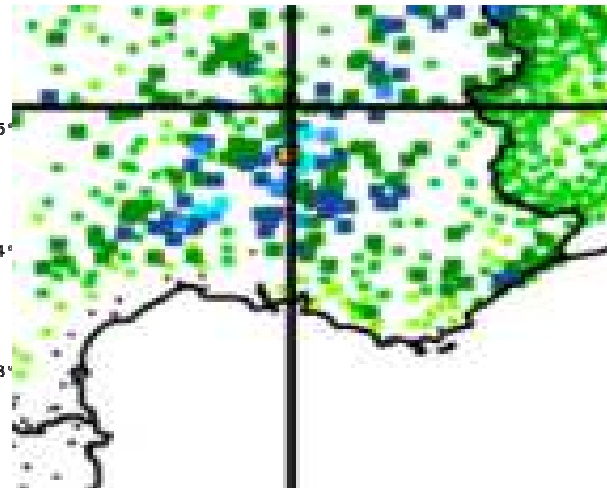
AROME_WMED

6hr cum. Rainfall
24 September 2012 (00-06)
(init 24/09-00UTC)



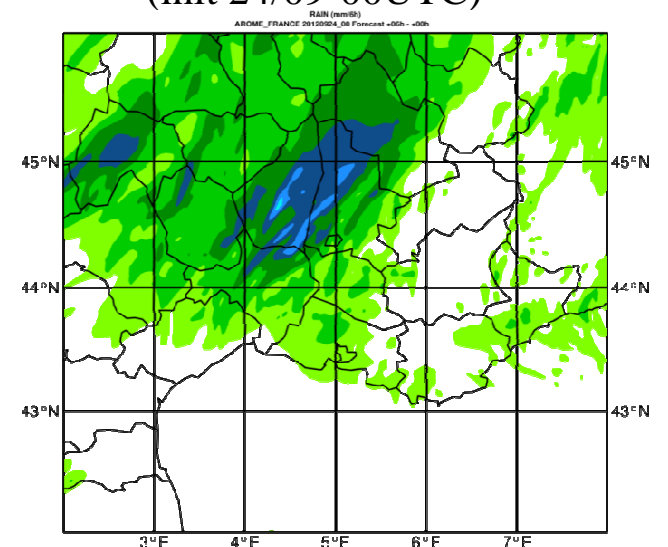
OBSERVATIONS

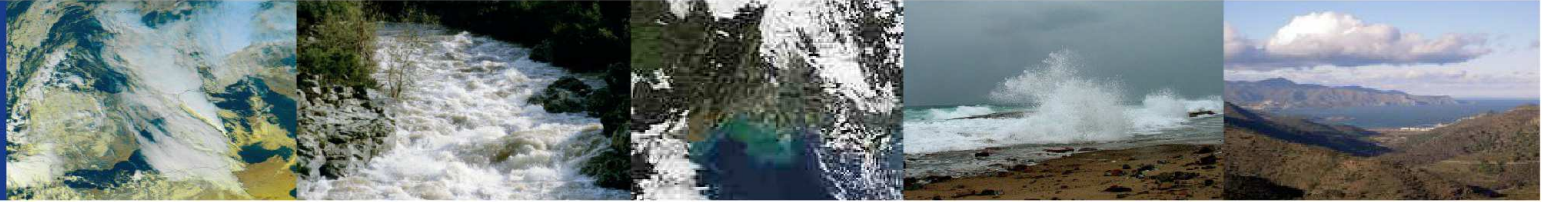
6hr cum. Rainfall
24 September 2012



AROME_FRANCE

6hr cum. Rainfall
24 September 2012 (00-06)
(init 24/09-00UTC)





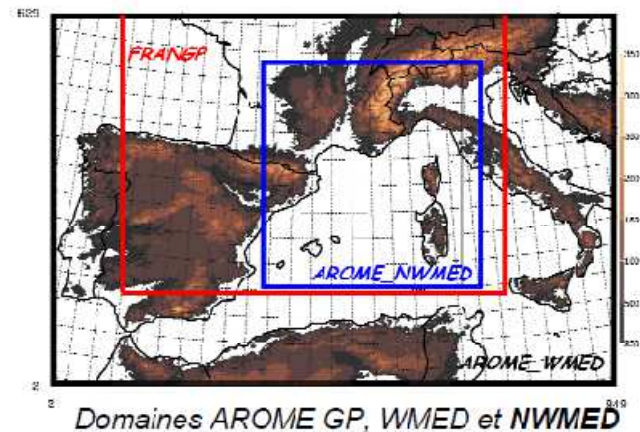
Contribution of convection-permitting models

at very short ranges :

Ensemblist approach with

AROME-EPS prototype (max range : +30h)

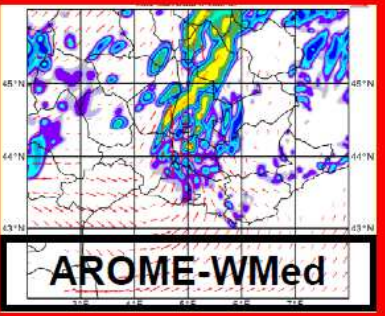
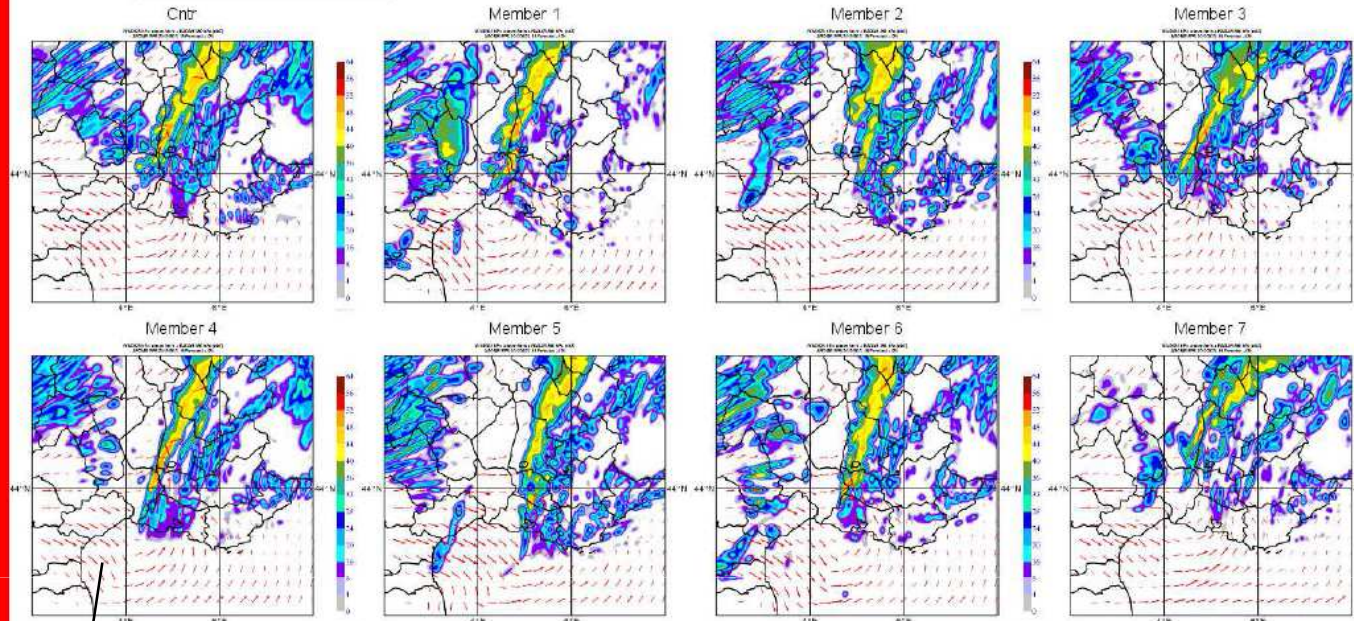
[23/18UTC run (1 run / day only !)]



Sites: Native, Cevennes-Vivarais,

Valid: 24 Sep 2012 06h UTC

AROME-EPS (8 members)



24th sept. 06 UTC

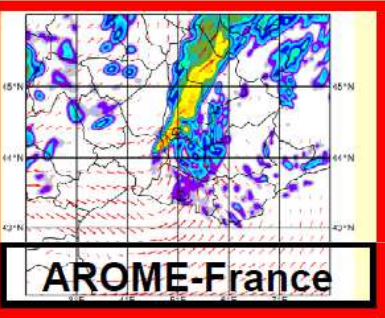


Fig. 6 – Reflectivities at 850 hPa forecast for Monday 24 September 2012 at 06 UTC (colors, in dBZ).

Red arrows represent winds forecast at 925 hPa. CV area (South-Eastern France).

- a) (left) AROME-EPS simulation : stamp map for each member : 23rd September 2012 18 UTC run, +12h range (forecast unavailable in real time).
- b) (right) AROME-WMed and AROME-France deterministic simulations : 23rd September 2012 00 UTC runs, +30h range.

stamps

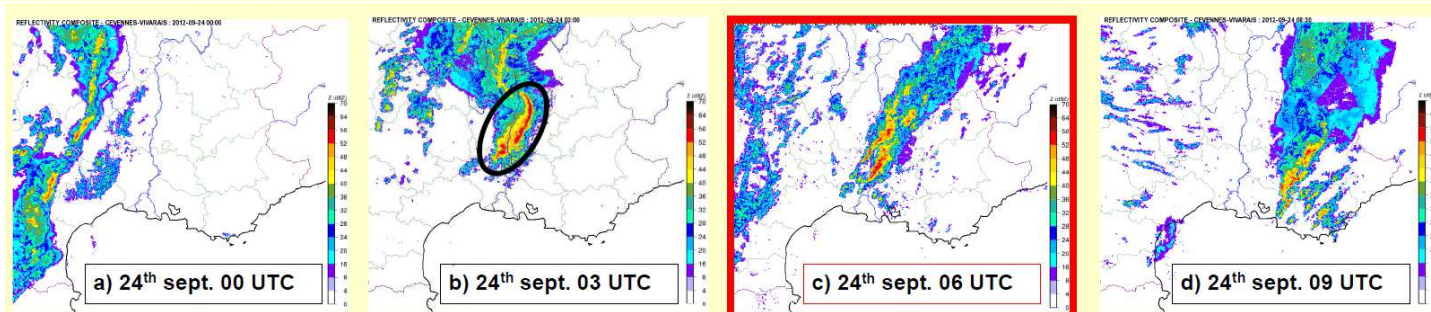
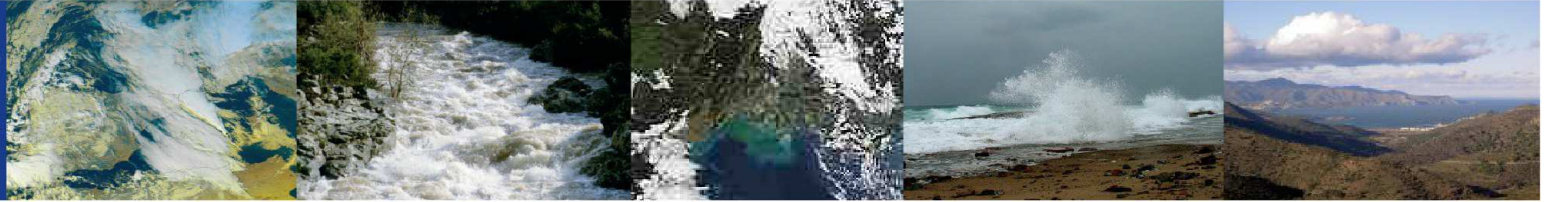


Fig. 2 – Radar reflectivities observed by Météo-France's ARAMIS operational network over the Cévennes-Vivarais (CV) French domain, on 24 September 2012 : a) initiation phase (00 UTC), b) mature phase (03 UTC), c) stationary phase (06 UTC), d) shifting phase (09 UTC).



Home>Models>Atmospheric models>Convection-permitting models>Ensemble forecast>Arome EPS 2.5km>Probabilities RR24

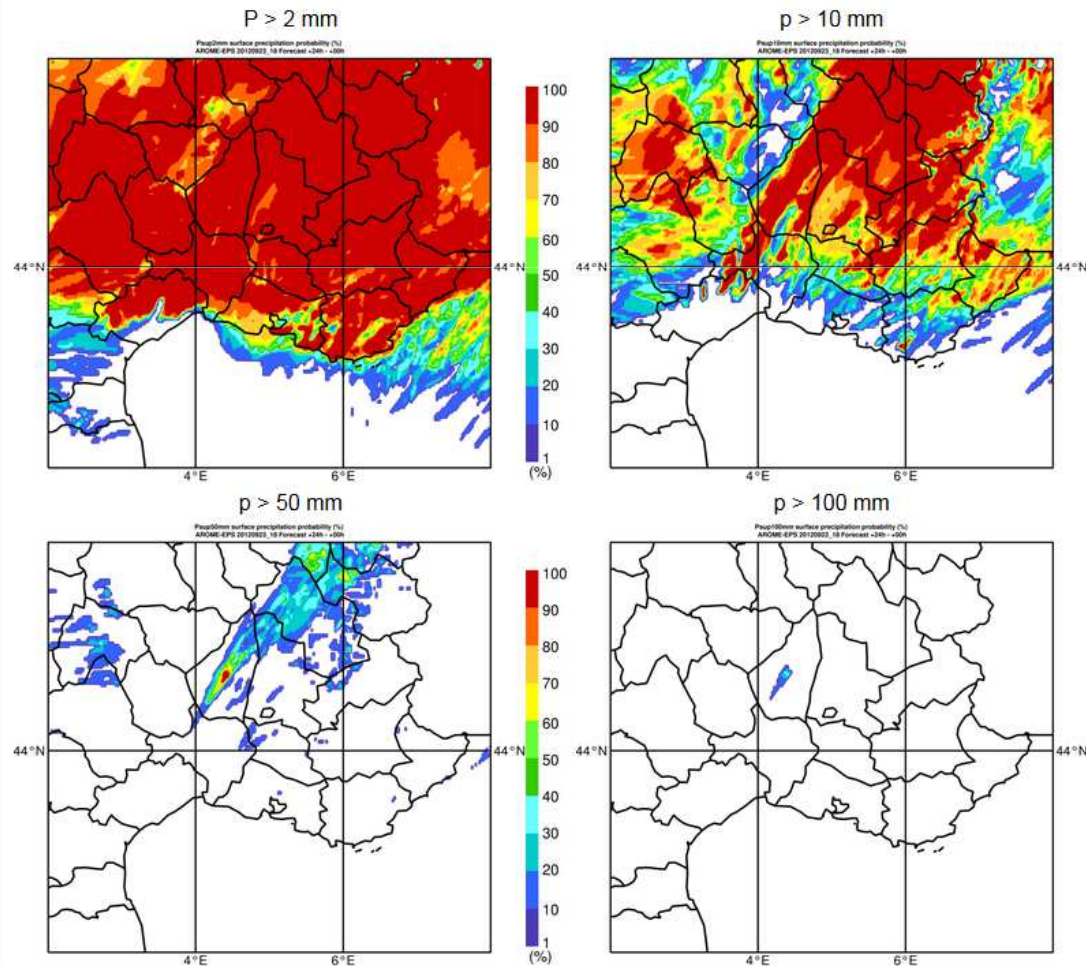
Probabilities RR24, Quantiles RR24, Quantiles RR1, Probabilities dBZ, Stamp maps RR24, Stamp maps dBZ, Probabilities V10m, Quantiles V10m,



Arome EPS: 24-hour cumulated surface precipitation probabilities from 18 UTC run

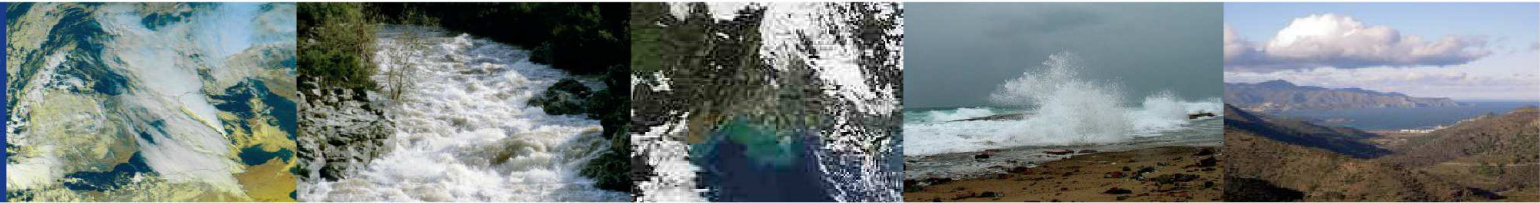
Sites: Native, **Cevennes-Vivarais**,

from 23 Sep 2012 18:00 UTC to 24 Sep 2012 18.00 UTC



AROME-EPS
probabilities
(RR24)

HyMeX

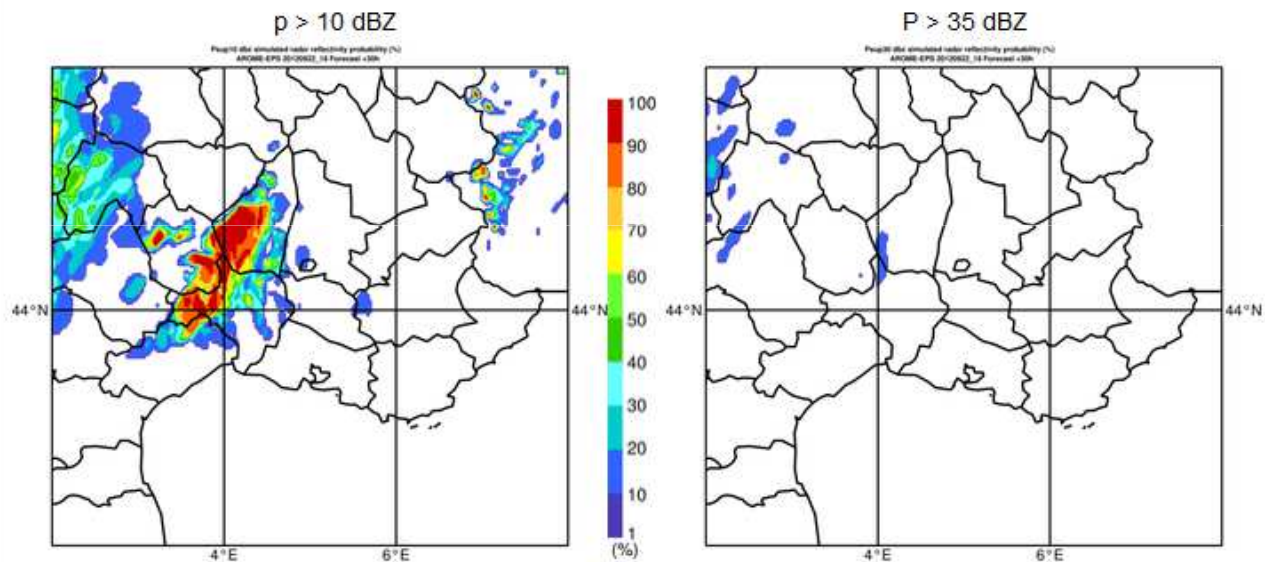


HyMeX

Home>Models>Atmospheric models>Convection-permitting models>Ensemble forecast>Arome EPS 2.5km>Probabilities dBZ
Probabilities RR24, Quantiles RR24, Quantiles RR1, Probabilities dBZ, Stamp maps RR24, Stamp maps dBZ, Probabilities V10m, Quantiles V10m,

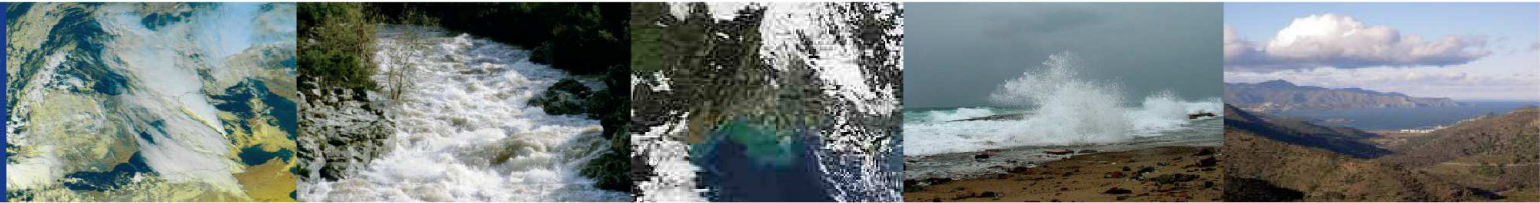
METEO FRANCE Arome EPS: Simulated radar reflectivity probabilities from 18 UTC run

24 Sep 2012 00h UTC



Archives

22/18UTC run



Sop1 Sop2

23 Sept

◀◀ 2012 ▶▶

1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30

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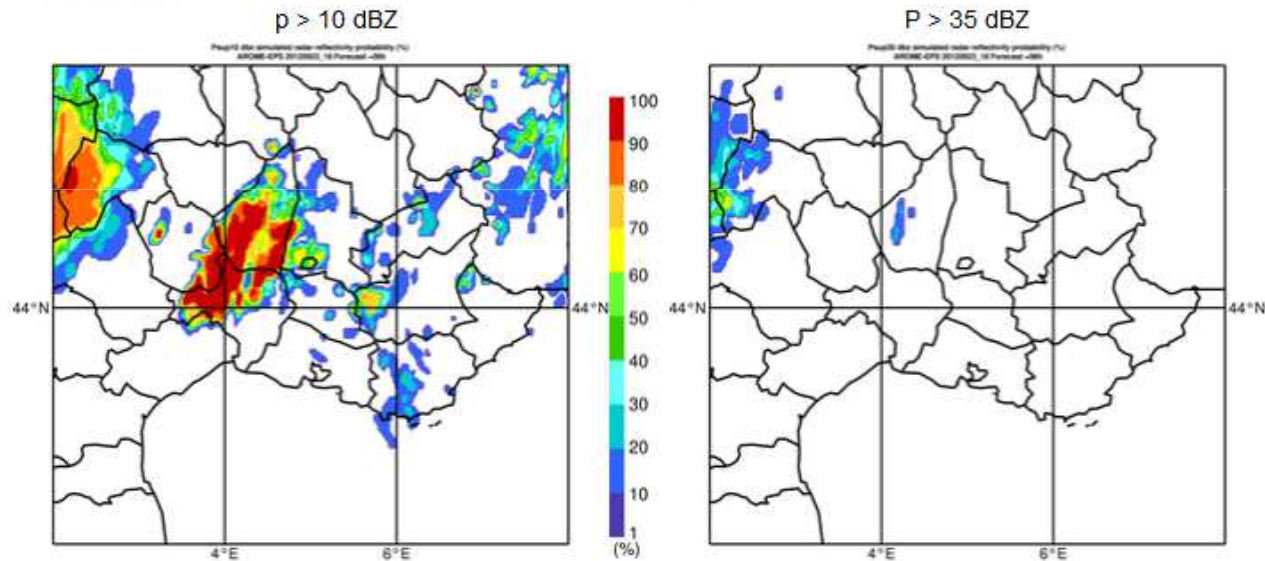
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▣ Observations

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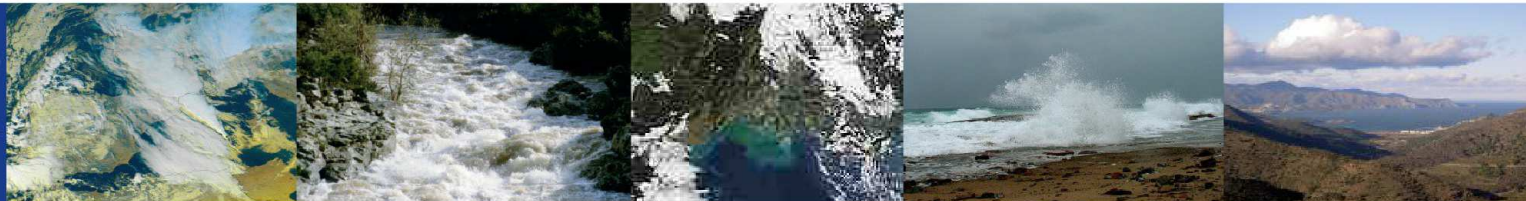
Contact us

Sites: Native, Cevennes-Vivarais,

◀ ▶ 24 Sep 2012 00h UTC ▾



23/18UTC run



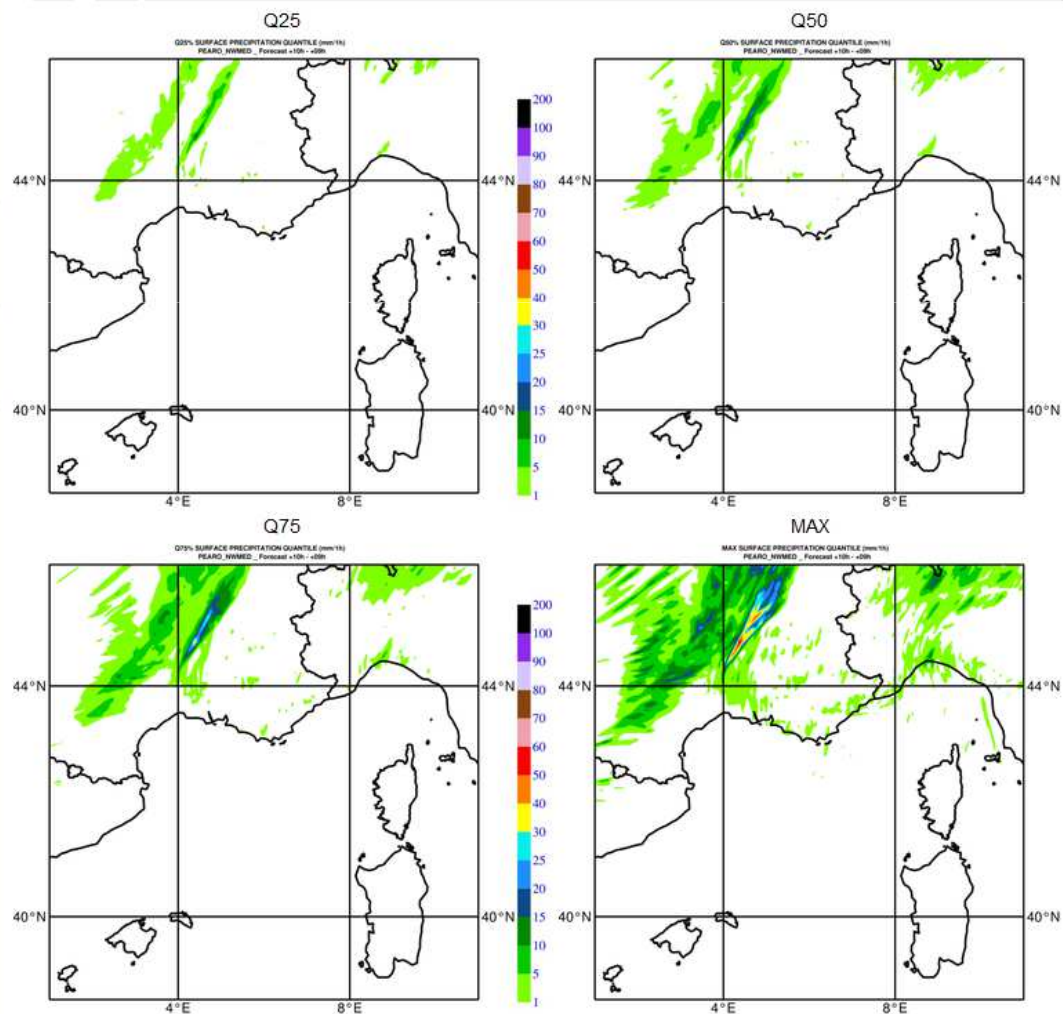
Home>Models>Atmospheric models>Convection-permitting models>Ensemble forecast>Arome EPS 2.5km>Quantiles RR1

Probabilities RR24, Quantiles RR24, Quantiles RR1, Probabilities dBZ, Stamp maps RR24, Stamp maps dBZ, Probabilities V10m, Quantiles V10m,

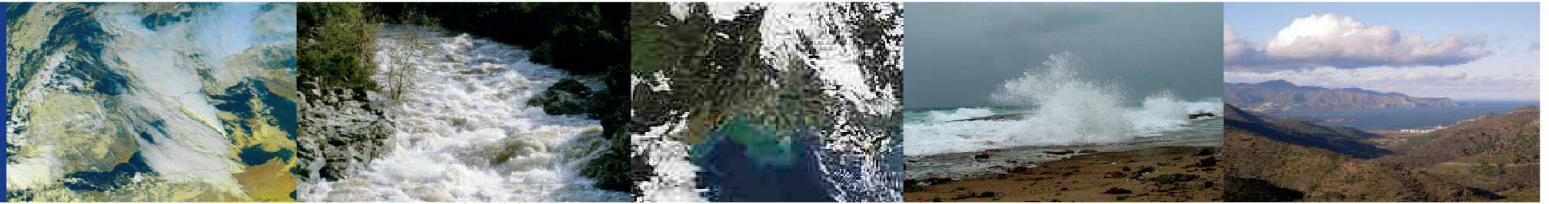


Arome EPS: 1-hour cumulated surface precipitation quantiles from 18 UTC run

from 24 Sep 2012 03:00 UTC to 24 Sep 2012 04:00 UTC



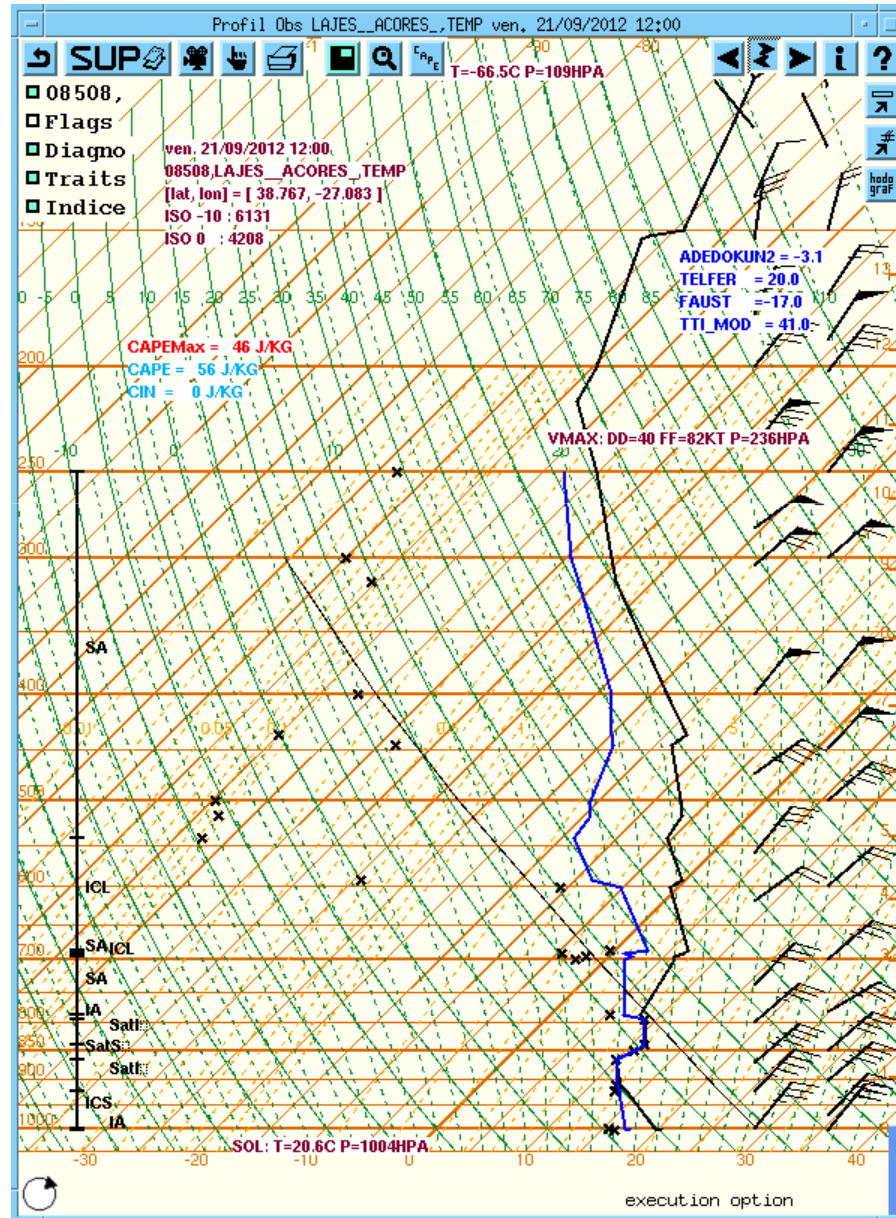
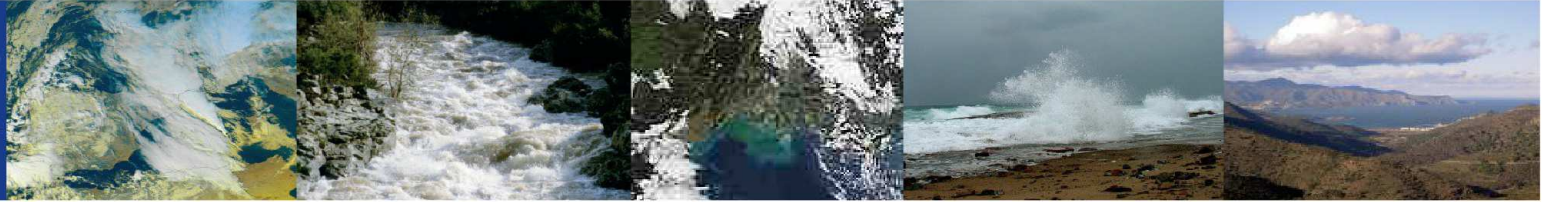
AROME-EPS
4 quantiles
(RR01)



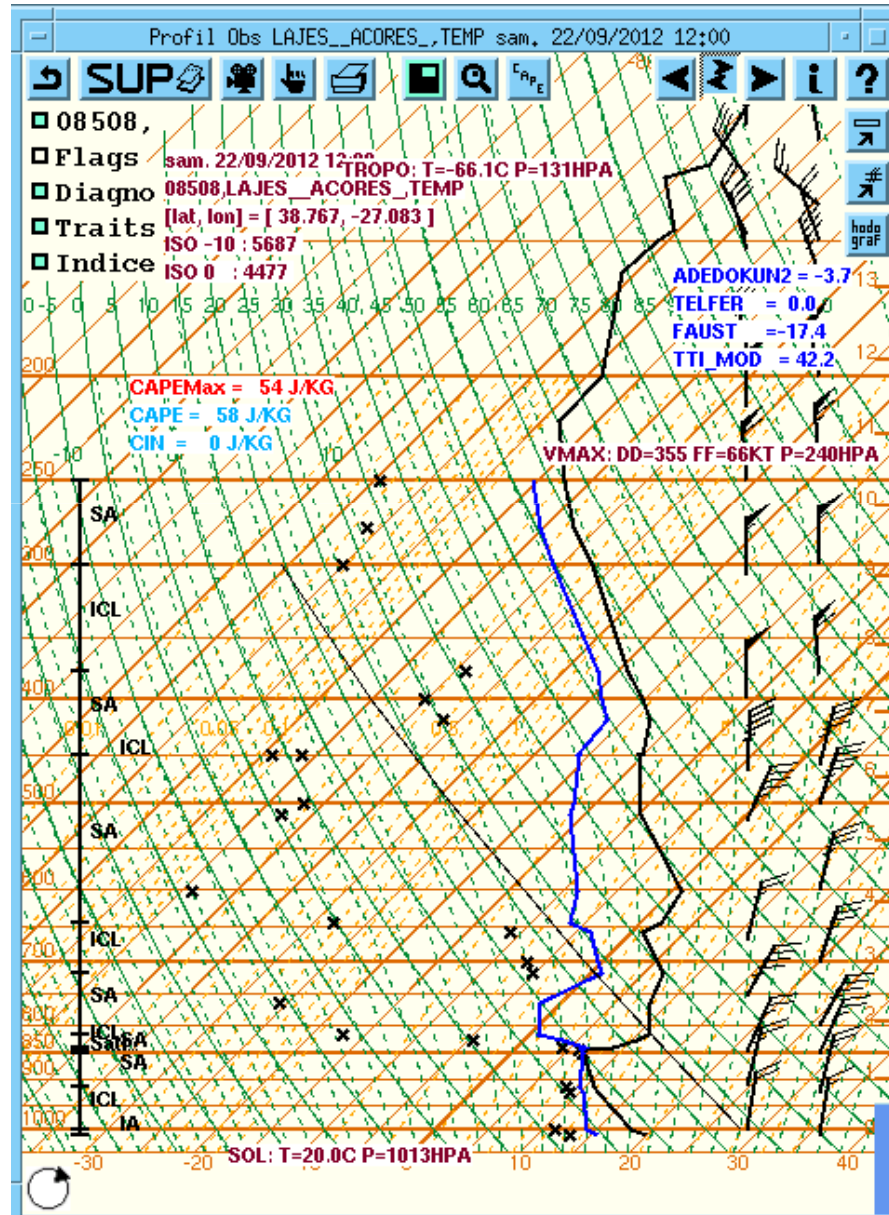
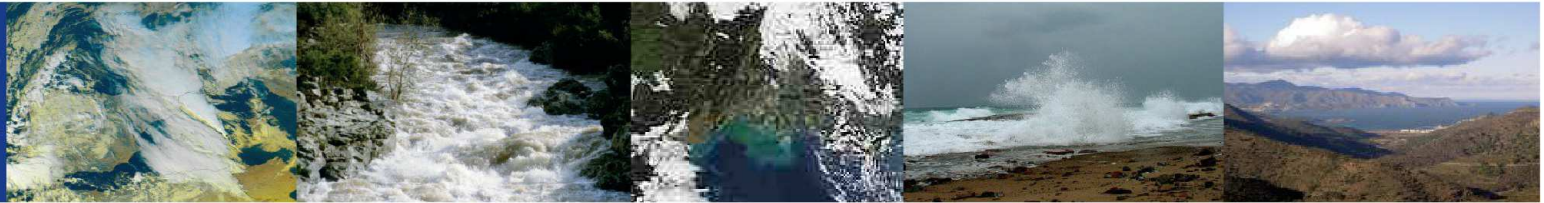
COMPLEMENTARY DATA :

- Acores RS between 21/12UTC and 24/12UTC
- IFS Analysis between 26/00UTC and 28/00UTC

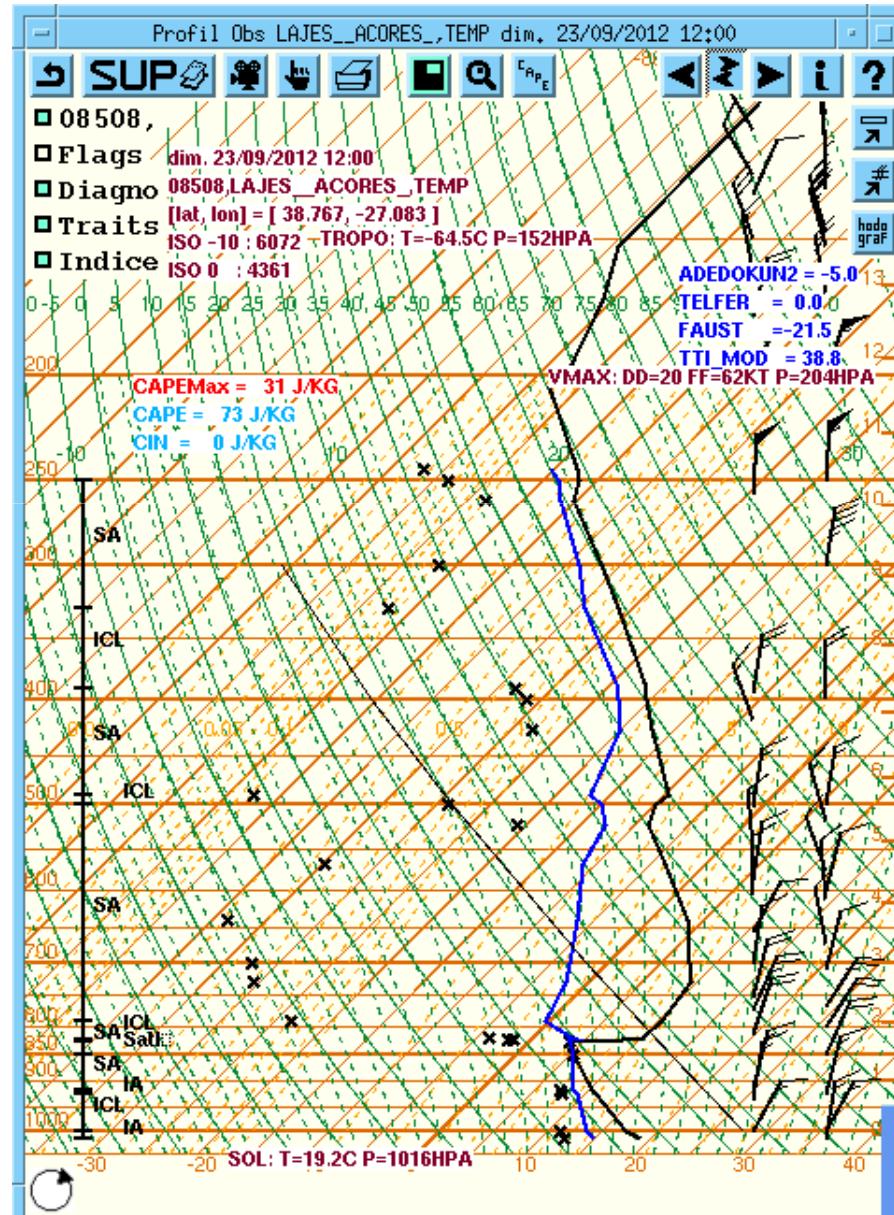
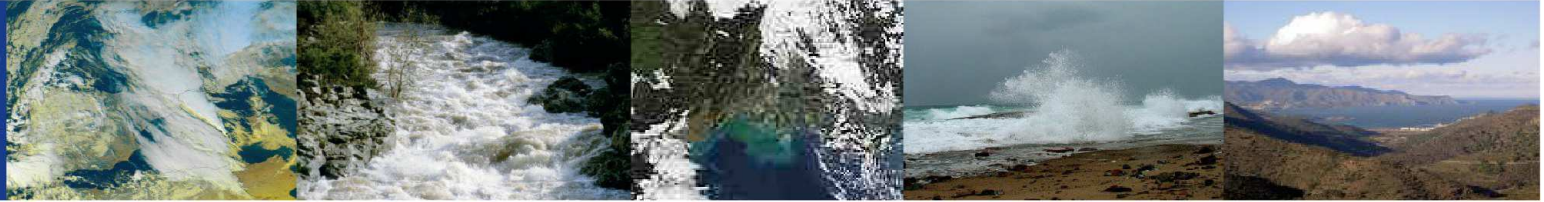
HyMeX



HyMeX

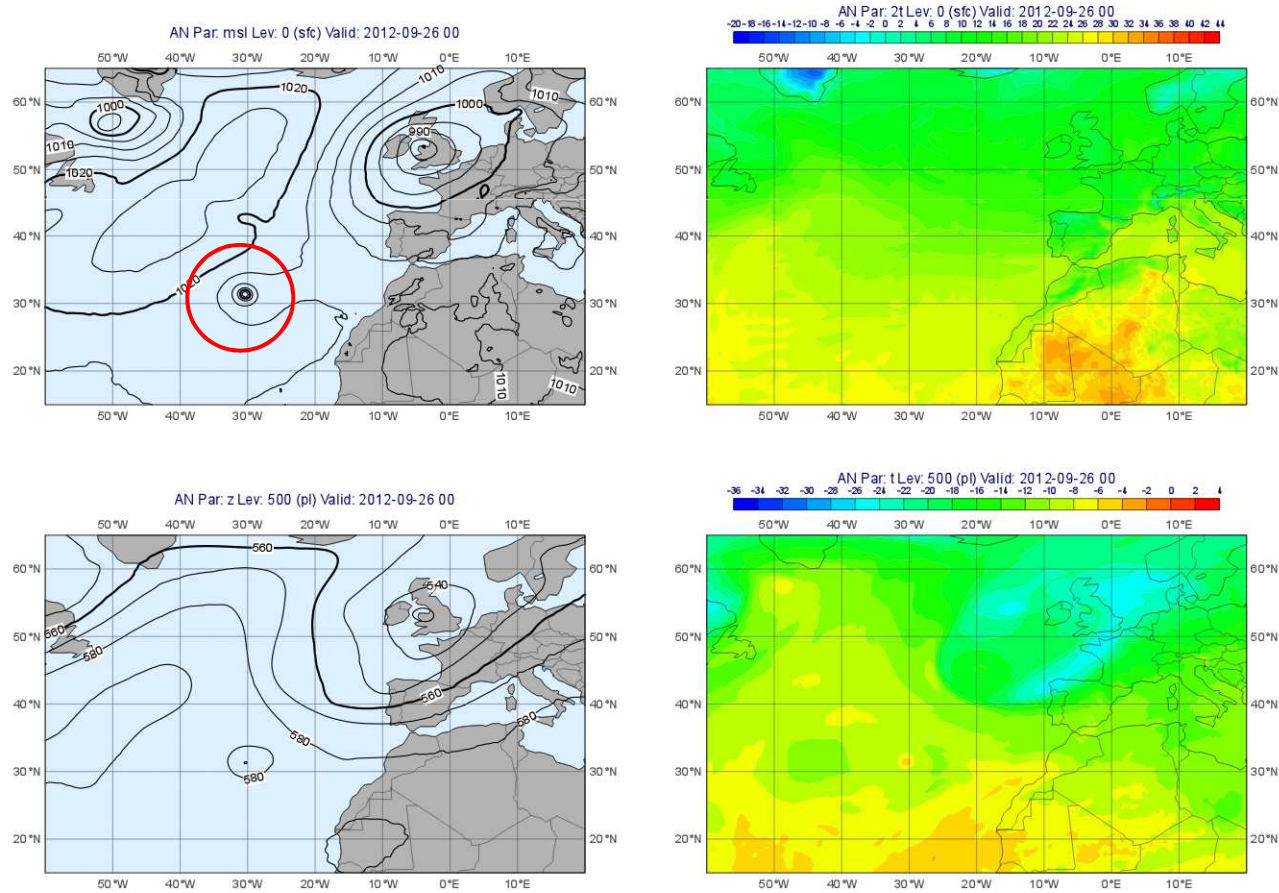


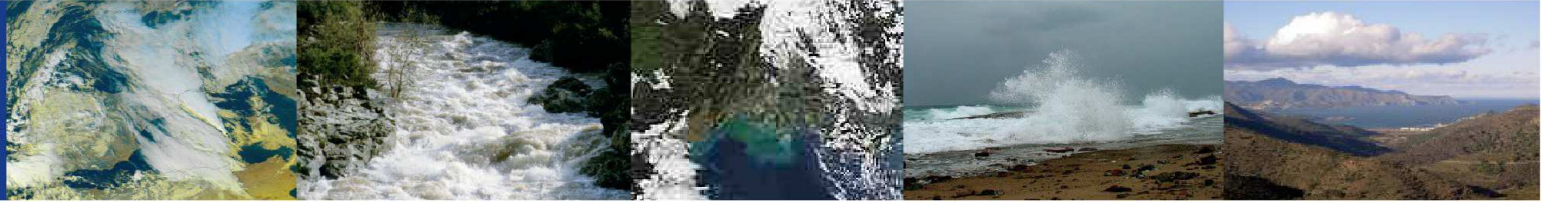
HyMeX



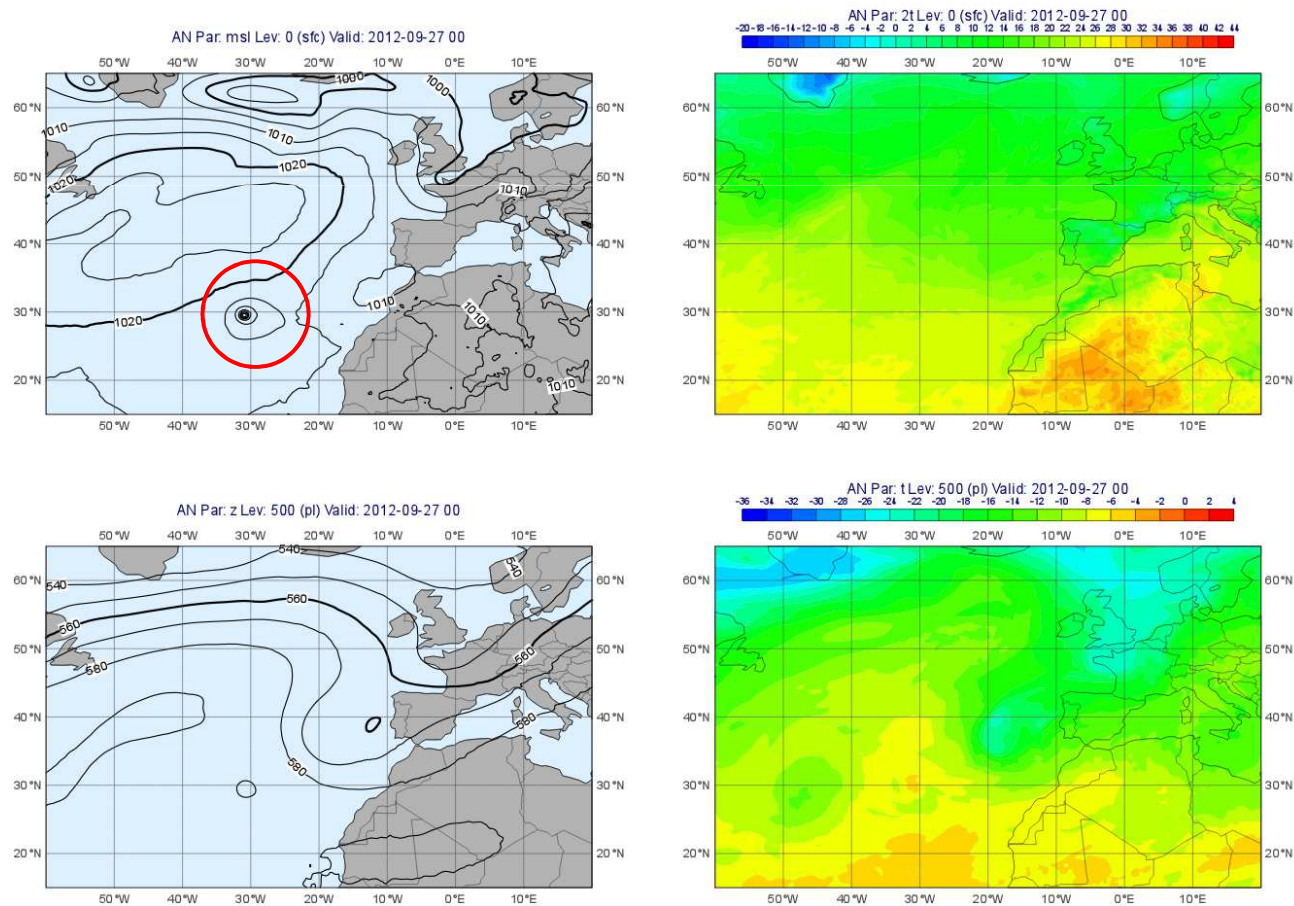


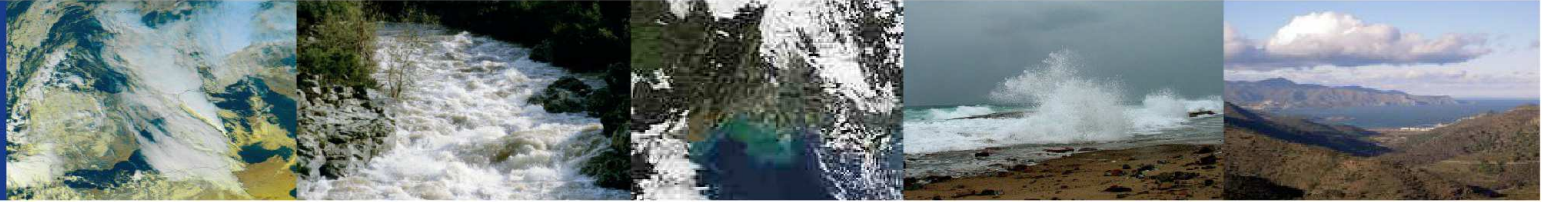
ECMWF IFS Analysis (26 Sept. 2012 00 UTC)





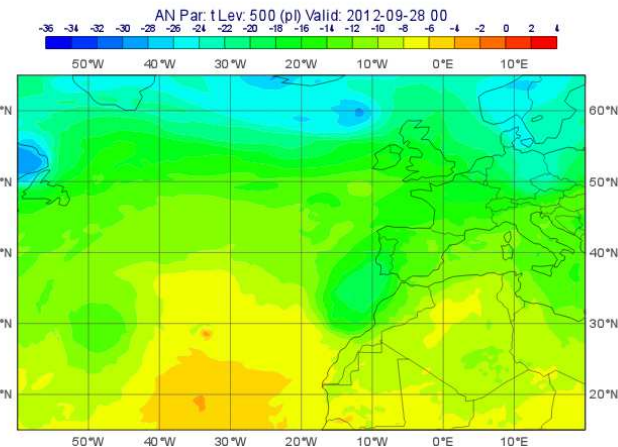
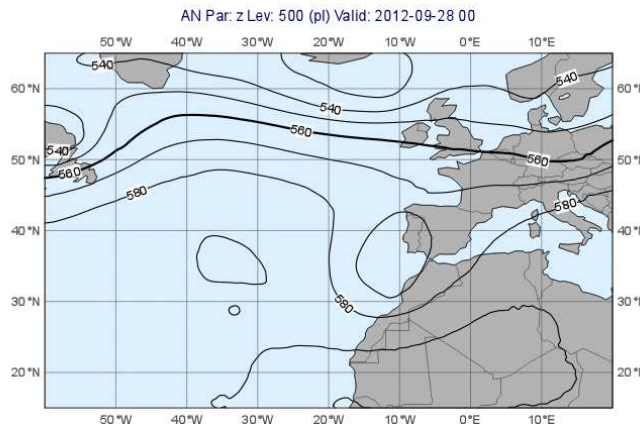
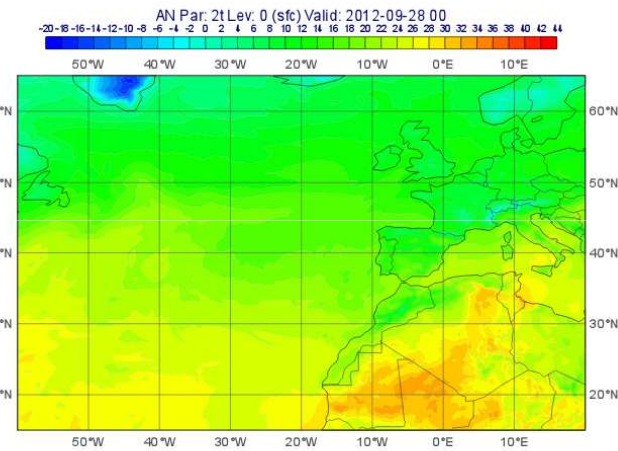
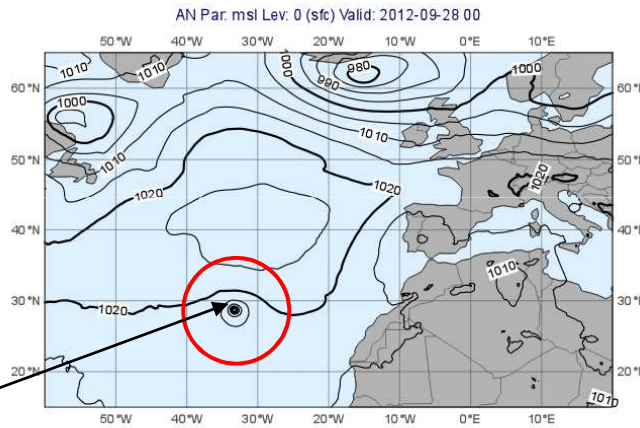
ECMWF IFS Analysis (27 Sept. 2012 00 UTC)



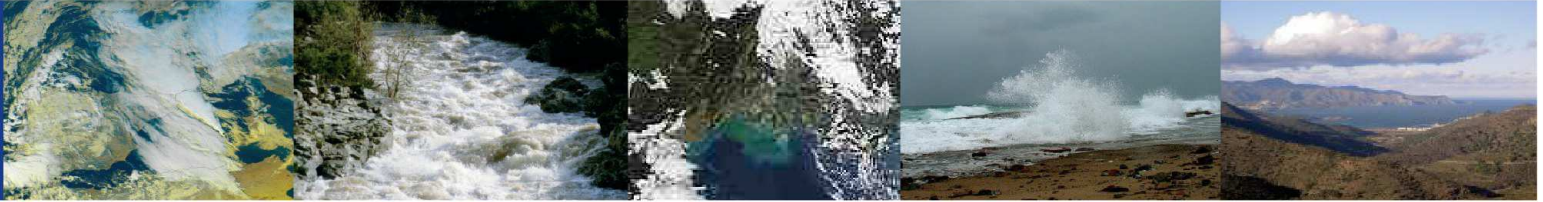


ECMWF IFS Analysis (28 Sept. 2012 00 UTC)

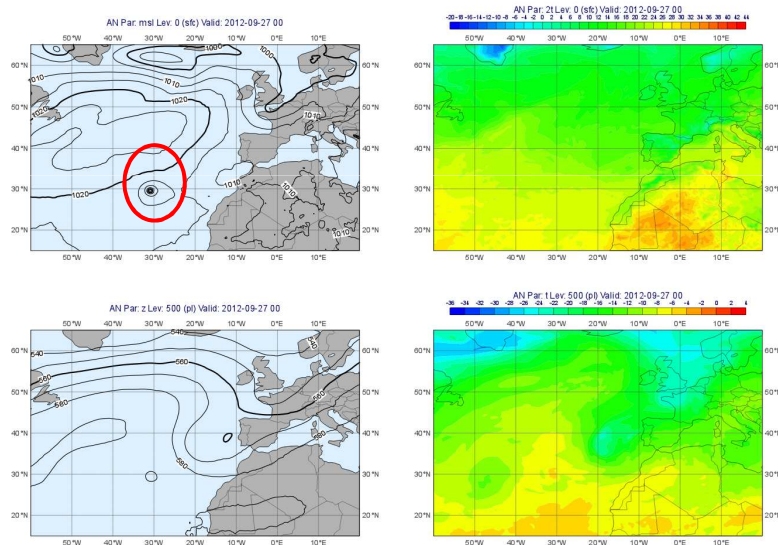
Nadine,
here
again !!



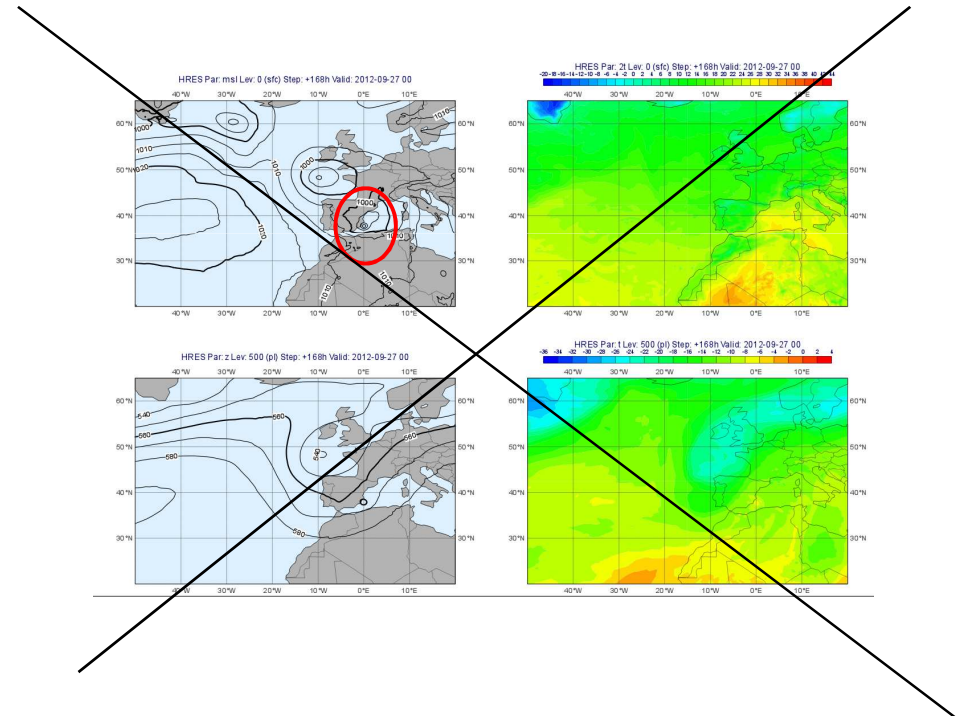
HyMeX



ECMWF IFS Analysis
(27 Sept. 2012 00 UTC)

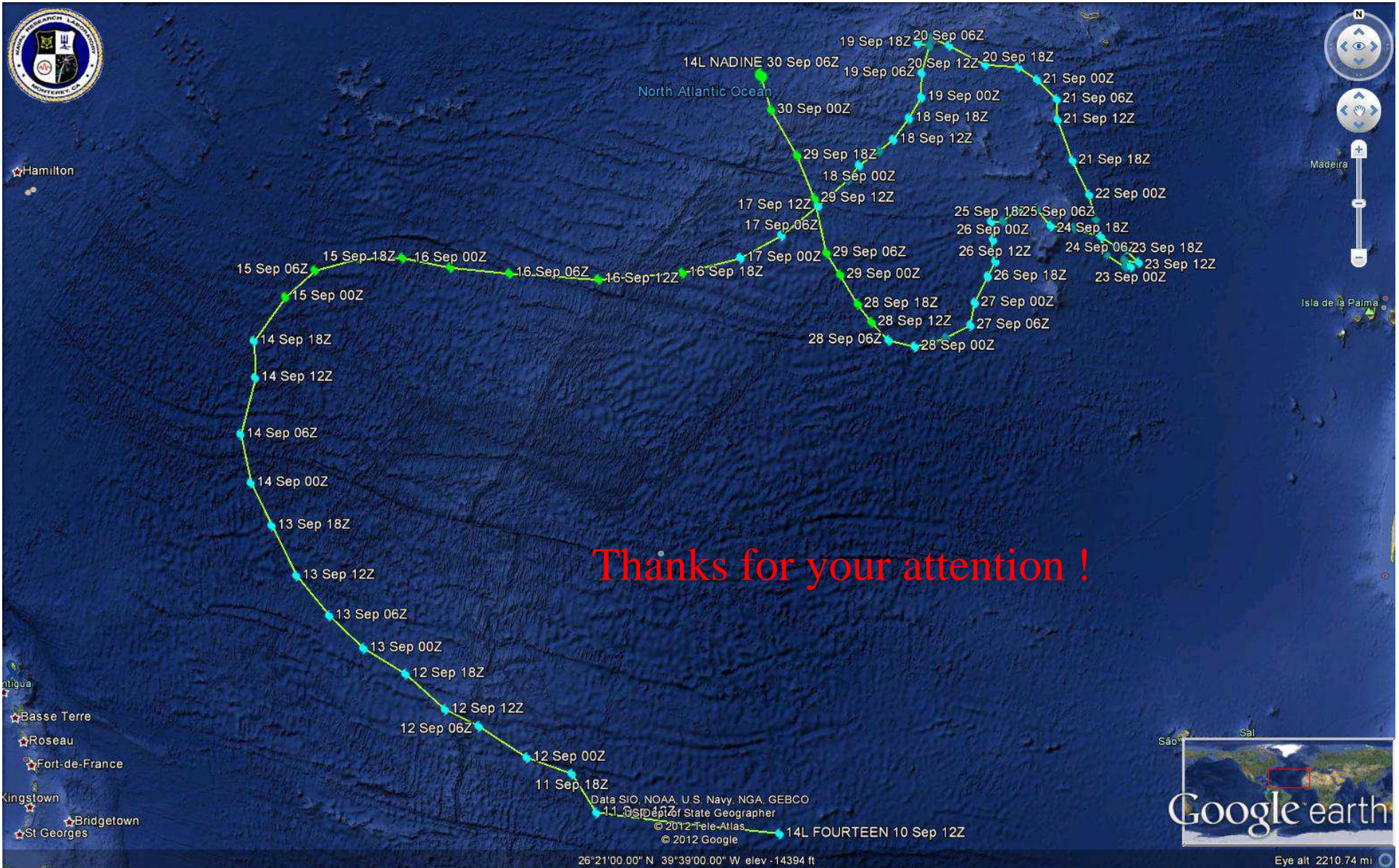
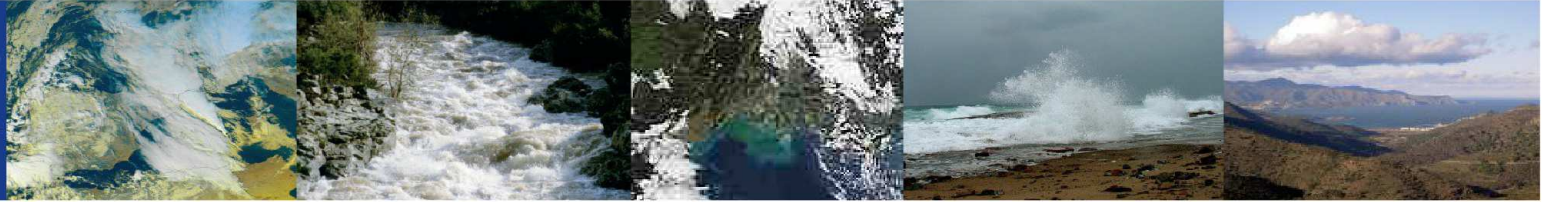


Deterministic IFS forecast
(20 Sept. 00 UTC run, D8)

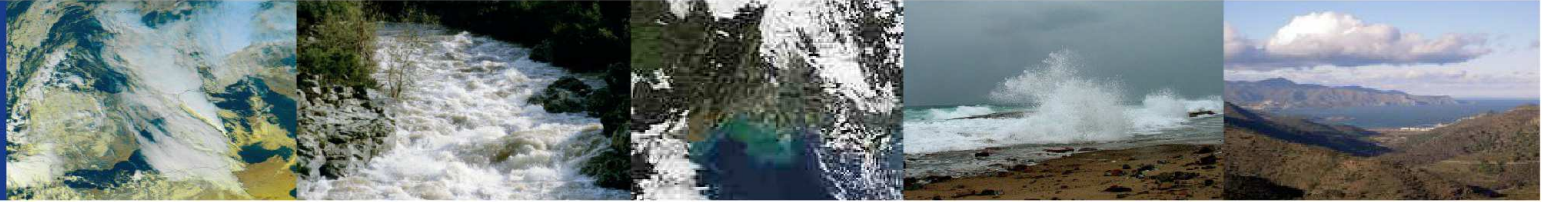


This extreme scenario
was finally totally wrong...

HyMeX

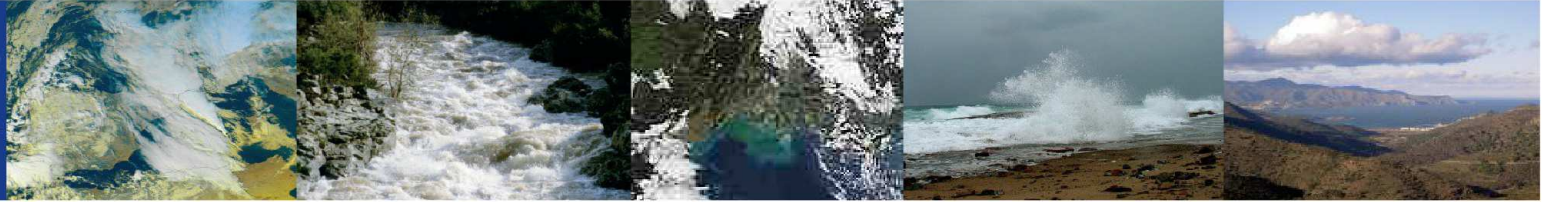


Thanks for your attention !



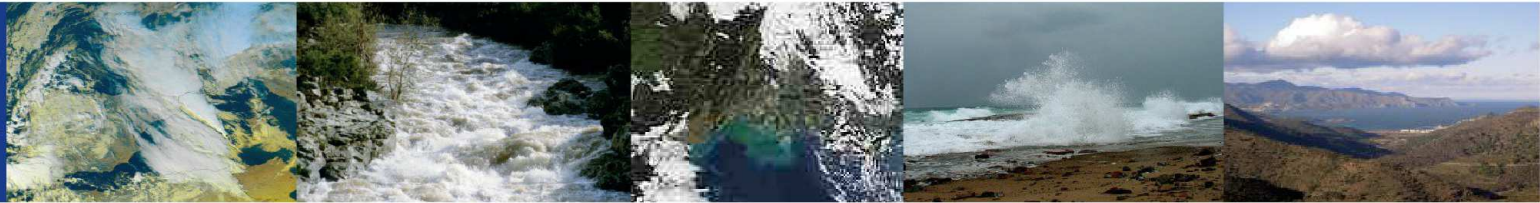
ANNEXE

- Le système DTS (Data Targeting System) du CEPMMT



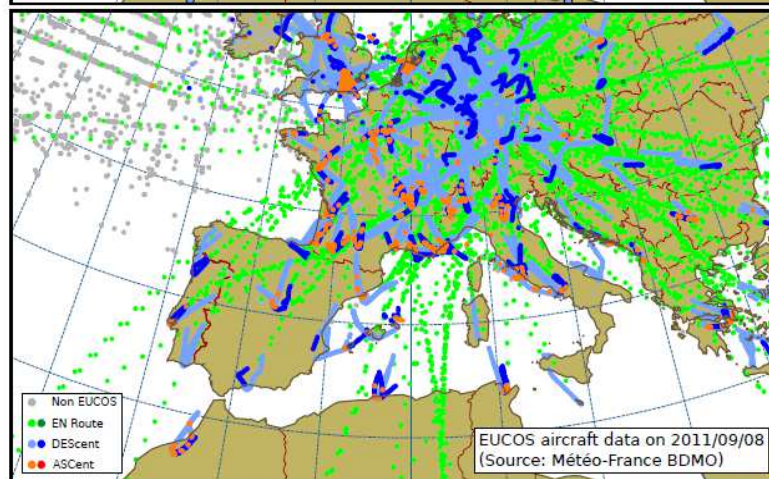
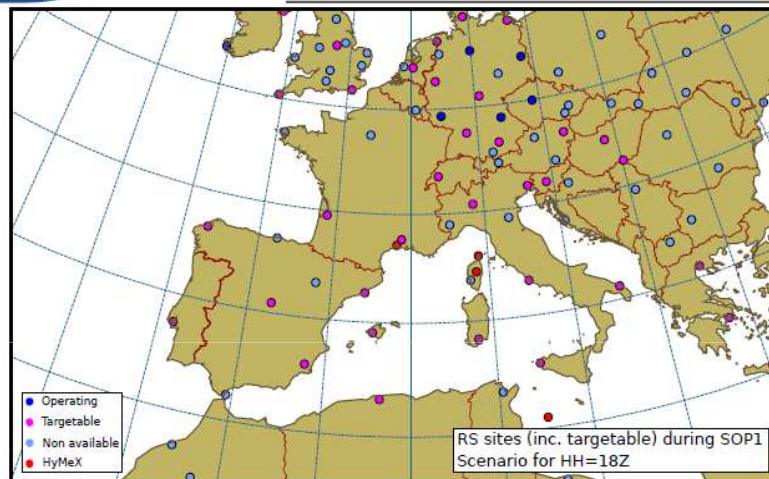
Le Système DTS

- **DTS : Data Targeting System.**
- Outil développé par le CEPMMT en 2008 (projet PREVIEW).
- But : aménager le réseau d'observation de façon *transitoire et locale* pour palier aux conséquences d'une faible prévisibilité (on parle aussi d'observations adaptatives)
- Le système DTS servira typiquement et préférentiellement *dans la période de 5 jours qui précèdera une POI.*
- L'instant de vérification doit se positionner au moment de survenue du phénomène d'intérêt.
- Dans le cas où le phénomène est susceptible de durer plusieurs jours, on visera au moins son déclenchement.



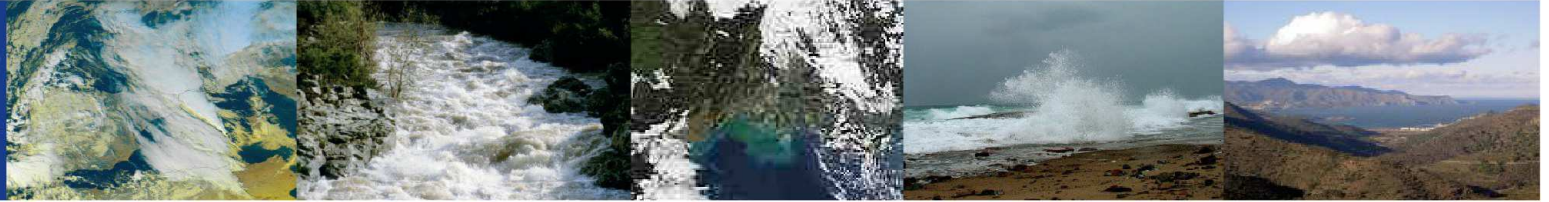
Quelles observations utiliser ?

Source : A. Doerenbecher



La plupart des sites de radiosondage fonctionnent aux réseaux de 00 h et 12 h. En conséquence, ce système ne peut-être beaucoup renforcé à ces horaires. La plus grande flexibilité est obtenue aux autres réseaux (06 h et 18 h, voire 03 h, 09 h, 15 h, 21 h sur les navires).

Les requêtes sur les AMDAR s'appliquent aux données collectées mais non transmises en temps réel (et donc pas disséminées sur le GTS). Il n'est pas aisé d'obtenir une image claire de ce que peut être un réseau augmenté. Si dans une région peu observée, il n'y a pas de transit par une compagnie affiliée à E-AMDAR, le manque de données subsistera, même si on sollicite plus d'observations.

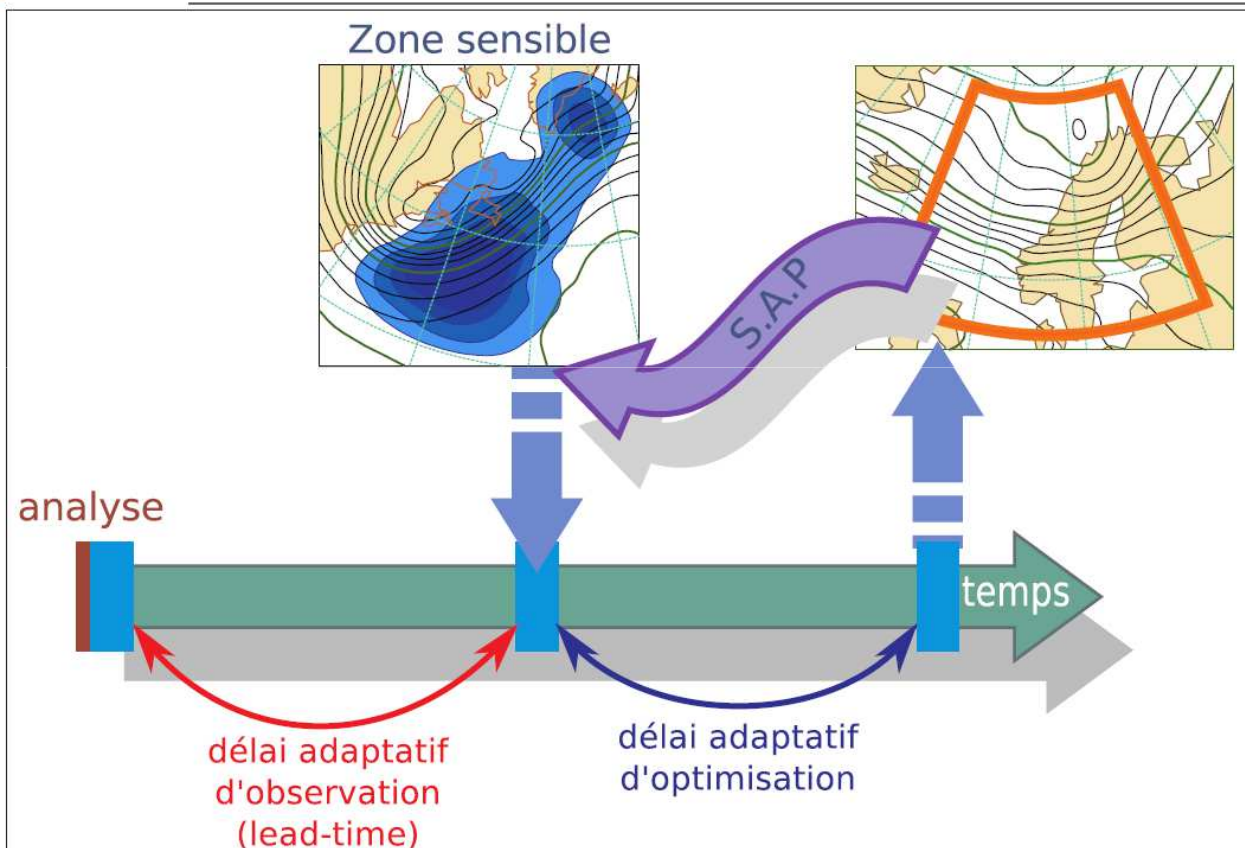


Philosophie du DTS

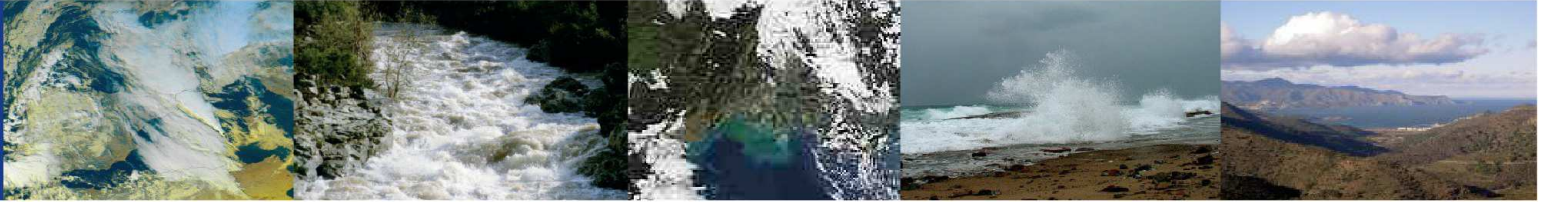
- Les **observations disponibles** sont **réparties de façon inégale** : certaines zones sont très denses et correspondent à des zones déjà très observées par ailleurs (par exemple sur l'Allemagne). . .
- L'intérêt de déploiement dans ces zones déjà "riches" est limité. *Mais le coût unitaire du radiosondage reste le même.*
- Une **enveloppe budgétaire globale** est affectée aux observations supplémentaires requises dans le cadre du DTS : une fois l'enveloppe dépensée, le système « s'arrête » !
- Le but est de ne pas faire de gaspillage inutile : on cherche à déployer ou acheter des observations supplémentaires à bon escient, **d'où l'importance de l'expertise des prévisionnistes et des scientifiques présents au HyMeX Operation Center.**



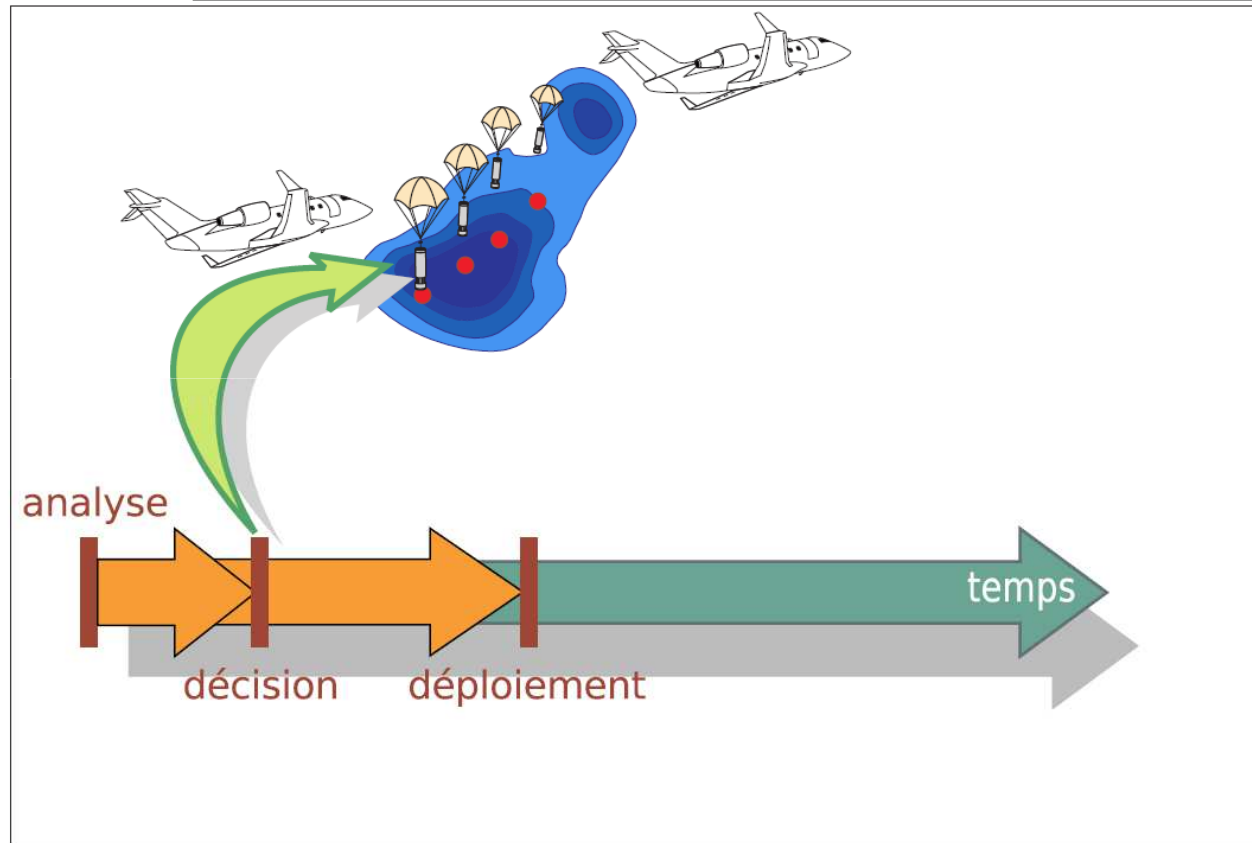
Observation adaptative : calcul des zones sensibles.



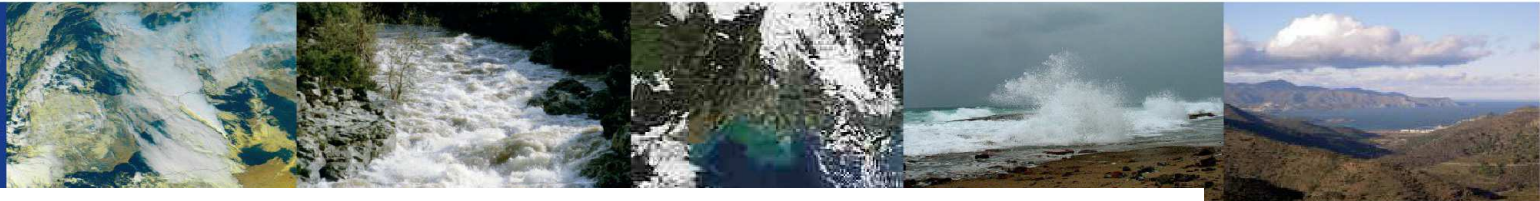
Source : A. Doerenbecher



Observation adaptative : décision et déploiement.



Source : A. Doerenbecher



Interface web du DTS : proposition de cas

Calendrier: choix de la date de base.

Cas proposés à la date de base.

Liens vers les autres étapes.

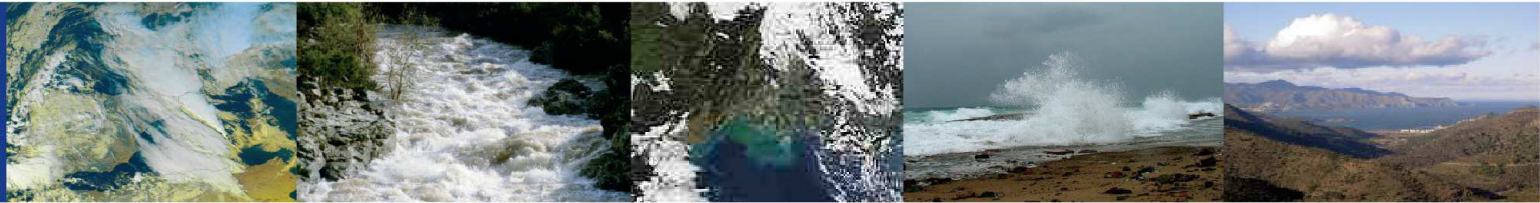
Les utilisateurs ne peuvent interagir qu'avec les pages du jour. Les modalités et les étapes dépendent de l'heure.

1 Choix de la date de vérification: **Vérification Time** détermine la durée totale

2 Choix de la zone de vérification: positionnement avec la souris (taille fixe)

3 Choix de la date d'observation: **Target Time** détermine la durée d'optimisation

Proposed by: D
 Lat: 45.0 Lon: -8.0
 Lat: 33.0 Lon: 10.0
 Verification Time
 Target Time



Interface web du DTS : Proposition de déploiement (cas 1089.2).

Calendrier:
choix de la date de base.

Cas acceptés
à la date de base.

Propositions de déploiements

Liens vers les autres étapes.

Extra Observation Proposal

Only Lead User can propose extra observations!

SAC results	
skimo	mst 4568 smb
mimo-france	llsl 2389 lbrl
occmf	llsl 2389 lbrl

ECMWF-SAP based on TE-SVs (moist TL95) and MSL
 Valid time: 20091107, 18 UT (Targeting Time)
 Shading: areas of 8, 4, 2, 1 x10⁴ km²
 trajectory initialized from fc 20091105, 00 UT +66 h
 Targ. time: 20091107, 18 UT / Verif. time: 20091109, 00 UT (opt: 30h)

Legend for observations:
 ● Disponibles (purple)
 ● En opération (blue)
 ○ Indisponibles (white)

Legend for zones:
 Zone sensible (orange)
 Zone de vérification (green)

Legend for deployment zone:
 Zone de déploiement (yellow)

Legend for observation list:
 ● modifiable à la main
 ● on peut se limiter à un seul type d'observation (AMDAR ou RS)
 Commentaires bienvenus

Proposed by: dts_embra (mst/2009 at 13:26 UTC)
Lat1: 62.8 **Lon1:** -47.8 **Verification Time:** 20091109
Lat2: 36.5 **Lon2:** -7.2 **Target Time:** 20091107.0

Observation List:

AMDAR
9420 31.35 -6.48
9865 25.37 -8.59
9879 28.77 -5.13
...

Extra Observations Description:
 mostly AMDAR and A Corvus and Lisboa (low level jet, gradient on temp) and (mizarik Greenland)
 Improved Observation
 (mimo-france, Accused)

Status: Accepted
 by solicitation By Lead User:

Choix de carte :

- type de sensibilité
- champ superposé

Observations (RS)

- Disponibles
- En opération
- Indisponibles

Zone sensible

Zone de vérification

Zone de déploiement :

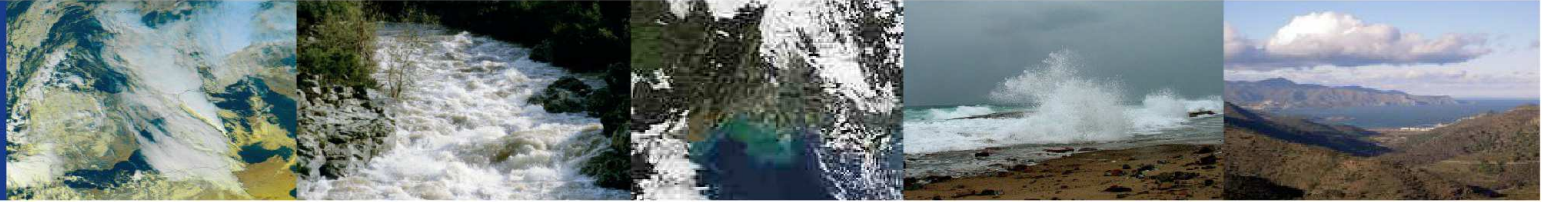
- dessinée à la souris et position variable
- inclut automatiquement tous les sites "disponibles" dans la liste des sondages

Liste des observations :

- modifiable à la main
- on peut se limiter à un seul type d'observation (AMDAR ou RS)
- Commentaires bienvenus

Action du Lead-User
 Proposition de déploiement rejetée (status = **Accepted**).
 Commentaires bienvenus

Source : A. Doerenbecher



Les 4 calculs de « Sensibilité » disponibles

- Vecteurs Singuliers : CEPMMT.
- ETKF : Météo-France.
- KFS : Météo-France.
- Ensemble Sensitivity (Université des Baléares).