

# A new trajectory interface in Metview 4

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The previous versions of the Metview meteorological workstation featured a trajectory computation model. This model has not been developed and maintained for several years therefore a decision was made to develop a new trajectory interface in Metview based on the widely used FLEXTRA trajectory model. This article gives an overview of the new interface and highlights how users can benefit from working with FLEXTRA in Metview 4.

## Using FLEXTRA

FLEXTRA is a trajectory model originally developed almost twenty years ago and still being used by a growing scientific community. It can be driven by meteorological input data from a variety of global and regional models including ECMWF analyses and forecasts. FLEXTRA is freely available from its joint home page with FLEXPART (a Lagrangian particle dispersion model) hosted by the Norwegian Institute for Air Research (NILU) at the following address:

- <http://transport.nilu.no/flexpart>.

From version 4.2 onwards Metview has the new trajectory interface allowing users to prepare input data for FLEXTRA, run FLEXTRA, visualise the generated trajectory data and perform computations on them.

Information about how Metview uses FLEXTRA is given in Box A.

## Trajectory computations, results and visualisation

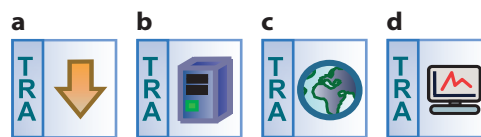
FLEXTRA trajectory computations require gridded input data for a set of atmospheric variables. Users can generate this data in Metview via the FLEXTRA Prepare icon (Figure 1a), which retrieves the required fields from MARS, performs the necessary pre-processing steps and presents the data in the desired format for FLEXTRA. Once the data is in place FLEXTRA trajectory computations can be started by using the FLEXTRA Run icon (Figure 1b). This icon provides a high level interface allowing users to define all the control parameters for a

### How FLEXTRA is used in Metview

A

FLEXTRA is not distributed with Metview, but has to be downloaded from the FLEXTRA web site and installed separately. Metview requires version 5.0 of FLEXTRA, which is using GRIB API to handle GRIB2 fields.

The FLEXTRA input data generation and trajectory visualisation do not require the existence of a FLEXTRA executable. However, FLEXTRA itself can be only run if an executable is present. The path to the FLEXTRA executable can be specified for Metview via the MV\_FLEXTRA\_EXE environment variable.



**Figure 1** The icons representing (a) FLEXTRA Prepare, (b) FLEXTRA Run, (c) FLEXTRA File and (d) FLEXTRA Visualiser in Metview 4.

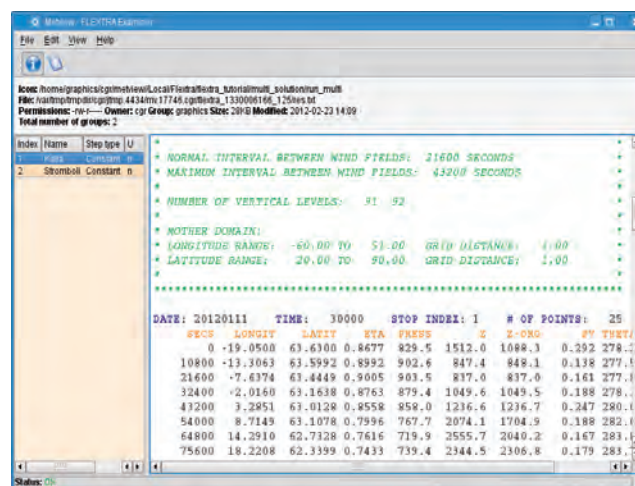
FLEXTRA run. Having finished the computations Metview concatenates the results into a single file, which can be saved, in whole or in part, to disk for a local copy.

The FLEXTRA output format is one of the supported data formats in Metview. FLEXTRA result files are represented as FLEXTRA File icons (Figure 1c) in the Metview desktop, no matter if they were generated via Metview or not. Users can inspect the contents of these files with the FLEXTRA examiner, as illustrated in Figure 2, and an advanced visualisation is also available for them.

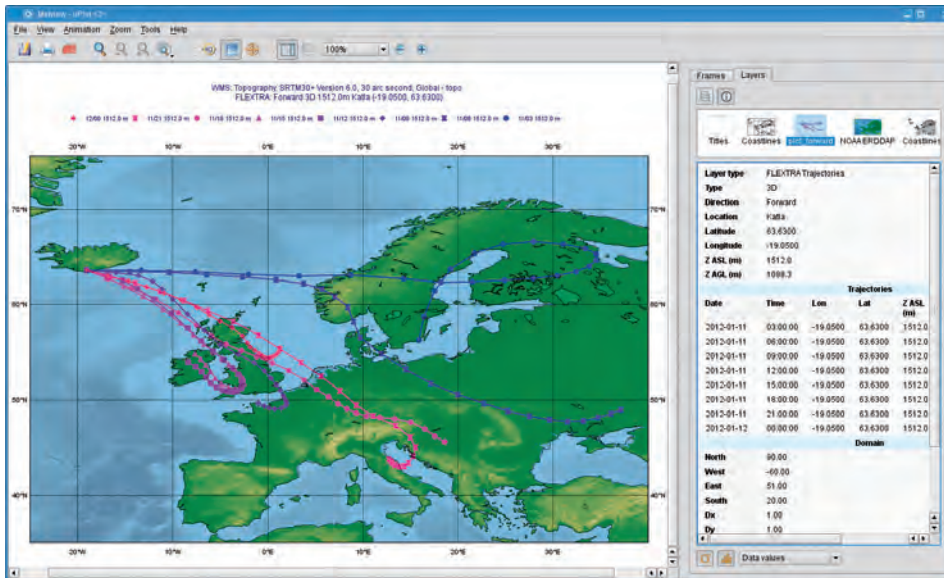
The FLEXTRA Visualiser, whose icon can be seen in Figure 1d, provides a high-level interface for selecting a subset of FLEXTRA results to be visualised in the desired plot type. With this icon Metview users can easily generate maps or graphs with symbol plotting and customise the graphical attributes of each trajectory individually as shown in Figures 3 and 4. A rich set of meta-data is displayed in the Layers tab on the right of the Display Window to help users interpret FLEXTRA plots. Figure 3 illustrates this feature.

## Metview Macro

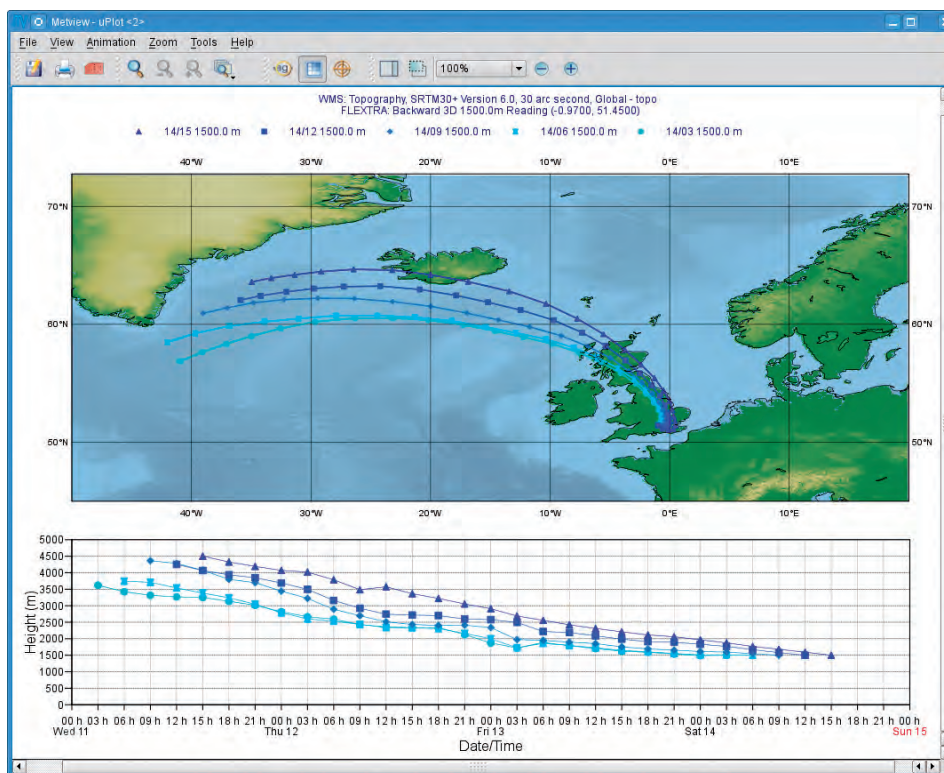
Metview's Macro scripting language offers a powerful framework for incorporating all the functionality provided by the FLEXTRA icons. A particularly useful feature of Macro is that users can access both the meta-data and data of trajectories via the `flextra_group_get()` and `flextra_tr_get()` macro functions. These functions allow users to derive new datasets and generate new plots out of FLEXTRA output data.



**Figure 2** The FLEXTRA examiner in Metview 4 offers an easy way to inspect FLEXTRA trajectory outputs.



**Figure 3** Three-dimensional forward trajectories, released from the same point but at different times, visualised using an automatically-generated colour palette. The sidebar on the right-hand side of the window displays detailed statistics about the visualised data.



**Figure 4** Different graphical representations of a the same three-dimensional backward trajectory group: on a map (top) and on a time-height graph (bottom).

**More information**

Metview users will find a tutorial that goes into more detail about how to use the FLEXTRA interface on the Metview documentation web page at:

- <http://www.ecmwf.int/publications/manuals/metview/documentation.html>

User feedback is important for improving Metview, and users are encouraged to send their suggestions by e-mail to [metview@ecmwf.int](mailto:metview@ecmwf.int).