

ecCodes BUFR decoding

Fortran 90 and Python API – part 2

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Introduction:

- Fortran 90 and Python subroutines to decode
 - Compressed BUFR data
 - Uncompressed BUFR data
- Practical examples

Is BUFR message compressed/uncompressed?

- The key 'compressedData' indicates whether the data are

compressed: value is 1
uncompressed: value is 0

Input arguments
Output arguments

- Use `codes_get` to obtain the value

call `codes_get(ibufr, 'compressedData', compressed)` in F90

`compressed = codes_get(ibufr, 'compressedData')` in Python

- When the BUFR data are compressed each element in the data section is an array with: `numberOfSubsets` elements.
- Therefore, a single subset can be accessed as an element of the array.
- When values are the same you get a single value!

Decoding uncompressed BUFR file F90 (1/2)

- Get number of subsets in the message

```
call codes_get (ibufr, 'numberOfSubsets', numberOfSubsets)
```

Input arguments

Output arguments

- We need to instruct ecCodes to unpack the data values

```
call codes_set (ibufr, 'unpack' ,1)
```

- Decode variables in a loop of subsets

- Use keywords 'extractSubset' and 'doExtractSubsets'

```
call codes_set(bufrin,'extractSubset',subsetNumber)
```

```
call codes_set(bufrin,'doExtractSubsets',1)
```

Decoding uncompressed BUFR file F90 (2/2)

- Create a copy of a message.

```
call codes_clone(bufirin, bufrou)
```

It creates a copy of a given message (bufirin) giving a new message in memory (bufrou) exactly identical to the original one.

- We need to instruct ecCodes to unpack the data values

```
call codes_set (bufrou, 'unpack',1)
```

Input arguments

Output arguments

Decoding uncompressed BUFR file python (1/2)

- Get number of subsets in the message

```
numberOfSubsets = codes_get (ibufr, 'numberOfSubsets')
```

Input arguments

Output arguments

- We need to instruct ecCodes to unpack the data values

```
codes_set (ibufr, 'unpack',1)
```

- Decode variables in a loop of subsets
for subsetNumber in range (1, numberOfSubsets)

- Use keywords 'extractSubset' and 'doExtractSubsets'

```
codes_set(bufrin,'extractSubset',subsetNumber)  
codes_set(bufrin,'doExtractSubsets',1)
```

Decoding uncompressed BUFR file python (2/2)

Input arguments

Output arguments

- Create a copy of a message.

```
codes_clone(bufrin, bufnout)
```

It creates a copy of a given message (bufrin) giving a new message in memory (bufnout) exactly identical to the original one.

- We need to instruct ecCodes to unpack the data values

```
codes_set (bufnout, 'unpack',1 )
```

Practical

- Navigate to your \$SCRATCH

```
cd $SCRATCH
```

- Copy the material for the practical

```
cp -r ~trx/ecCodes/2019/bufr_api_decode .
```

- There are subdirectories for F90 and python

```
cd F90
```

```
cd python
```

- The directories are named by practical number

```
e.g. cd bufr_decode_practical1
```

- Have a look at the README

- Have fun



Practical 5: Decode compressed BUFR data

1. Open the **amv8.bufr** in read mode
2. Load the messages in memory
3. Loop over messages
4. Get '**numberOfSubsets**'
5. '**unpack**' the data section
6. Decode and print values in the fifth subset of
 - **latitude**
 - **longitude**
 - **satelliteZenithAngle**
7. Release the message
8. Close the BUFR file



codes_open_file

codes_bufr_new_from_file

codes_set (ibufr,'unpack',1)

codes_get

codes_release

codes_close_file

Practical 6: Decode uncompressed TEMP data

1. Open the **temp.bufr** in read mode
2. Load the messages in memory
3. Loop over messages
4. '**unpack**' the data section
5. Decode and print values of
 - **latitudeDisplacement**
 - **longitudeDisplacement**
 - **airTemperature**
6. Release the message
7. Close the BUFR file

How many observations of the **airTemperature** do we have?

What are the values of the **airTemperature** at the beginning and at the end of the observation.



`codes_open_file`

`codes_bufr_new_from_file`

`codes_set (ibufr,'unpack',1)`

`codes_get`

`codes_release`

`codes_close_file`

Practical 7: Decode multisubset SYNOP data

1. Open the **synop_multisubset.bufr** in read mode
2. Load the messages in memory
3. **'unpack'** the data section
4. Use keywords **'extractSubset'** and **'doExtractSubsets'**
5. Use `codes_clone (inbufr,outbufr)`
6. Decode and print from all subsets
 - 'nonCoordinatePressure'
 - 'stationOrSiteName'
7. Release the message



```
codes_set(bufrin,'extractSubset',subsetNumber)
codes_set(bufrin,'doExtractSubsets',1)
```



```
codes_open_file
codes_bufr_new_from_file
codes_set (ibufr,'unpack',1)
codes_get
codes_release
codes_close_file
```

References

- ecCodes

<https://software.ecmwf.int/wiki/display/ECC/ecCodes+Home>

- BUFR tables

<https://software.ecmwf.int/wiki/display/ECC/BUFR+tables>

- Error codes are listed under:

http://download.ecmwf.int/test-data/eccodes/html/group__errors.html

