ecCodes BUFR decoding

Fortran 90 and Python API – part 2

Marijana Crepulja

Marijana.Crepulja@ecmwf.int

ECMWF

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: numberOfSubset 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)

Input arguments
Output arguments

- Create a copy of a message.

```
call codes_clone(bufrin, bufrout)
```

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

The new message contains only one subset.

- We need to instruct ecCodes to unpack the data values

```
call codes_set (bufrout, ‘unpack',1)
```

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, bufrout)
```

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

The new message contains only one subset.

- We need to instruct ecCodes to unpack the data values

```
codes_set (bufrout, ‘unpack',1 )
```

Practical

- Navigate to your $SCRATCH

  cd $SCRATCH

- Copy the material for the practical

  cp -r ~trx/ecCodes/2018/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

Helpful Tips

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.

Helpful Tips

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

thank you
danke
рахмат
謝謝
ngiyabonga
teşekkür ederim
Баярлалаа
спасибо
faafetai lava
mersi
kia ora
barka
welalin
tack
spas
dank je
misaotra
matondo
paldies
grazzi
mahalo
tapadh leat
gracias
vinaka
спасибі
blagodaram
kiitos
dankie
nanni
nandri
dhanyavad
mauruuru
köszönöm
hvala
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bayarlalaa
bedankt
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dankon
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ありがとう
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rahmat
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merci