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The cf-python software library

5th December 2014

Data, metadata and the CF conventions

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data

```
3.56, 6.78, ..., -0.32, 1.86
```

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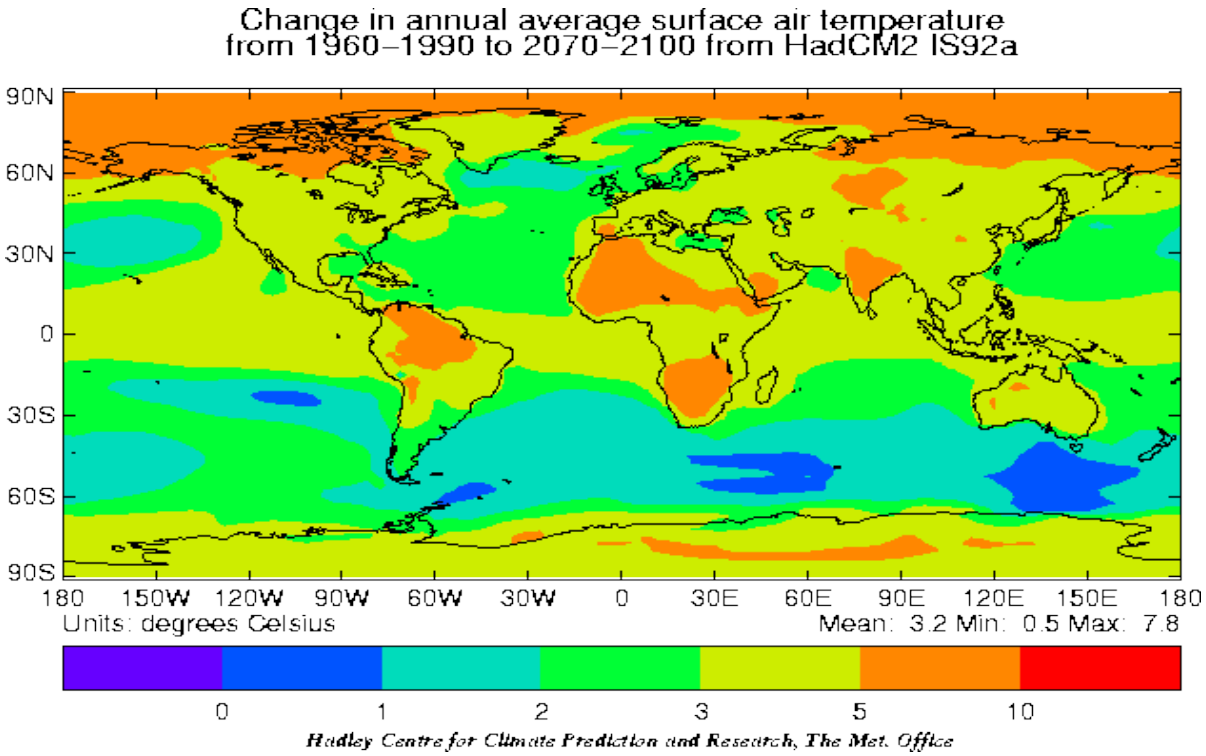
data

```
3.56, 6.78, ..., -0.32, 1.86
```

data + metadata



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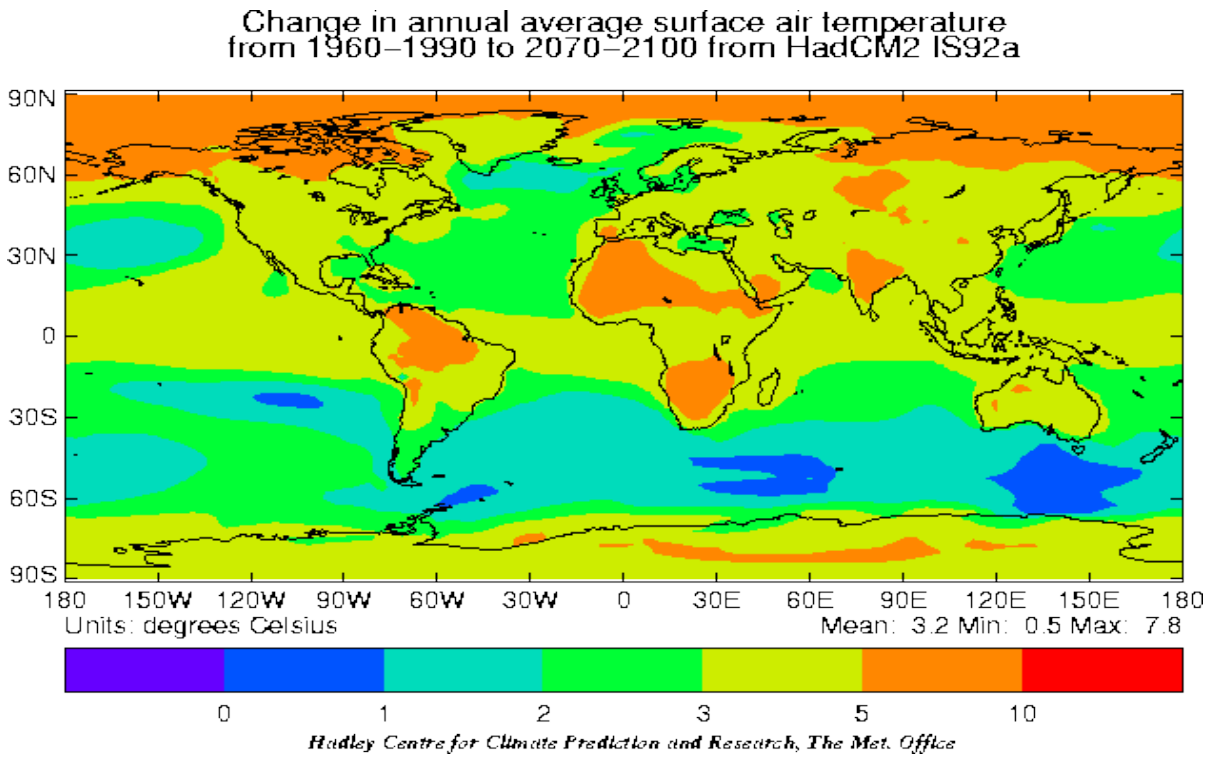

- CF conventions: A recognized standard for encoding **C**limate and weather **F**orecast metadata to support interoperability for earth science data from different sources
- Particularly suited to climate model outputs

The cf-python library

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- An open source Python software package developed by NCAS to fully utilize the CF conventions

- Reads, manipulates and writes datasets from PP and netCDF files
  - and UM output fields files by early 2015

cfpython.bitbucket.org

The cf-python library

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Read netCDF, netCDF and PP (and soon UM files) format files.

Create fields.

Write fields to netCDF files on disk.

Aggregate collections of fields into a single field.

Create, delete and modify a field's data and metadata.

Select fields according to their metadata.

Subspace a field's data to create a new field.

Perform broadcastable, metadata-aware arithmetic, comparison and trigonometric operations with fields.

Collapse fields by statistical operations.

Sensibly deal with date-time data.

Visualization with **cfplot**

Copes with larger-than-memory datasets

An example with big data

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On a machine with a maximum of **32G** of memory …

Manipulate a larger-than-memory 4D field stored across multiple PP files and save it as a single CF-netCDF file:

```
$ du -h xgdriaa.pd*.pp
40G     xgdriaa.pdk9498.pp
40G     xgdriaa.pdk949a.pp
40G     xgdriaa.pdk949c.pp

$ python
>>> import cf
>>> x = cf.read('xgdriaa.pd*.pp', match='mass_fraction_of_cloud_ice_in_air')
>>> x
<CF Field: mass_fraction_of_cloud_ice_in_air(model_level_number(70), time(6), latitude(2890), longitude(10222))>
>>> y = cf.collapse(x, 'max', 'time')
>>> y
<CF Field: mass_fraction_of_cloud_ice_in_air(model_level_number(70), time(1), latitude(2890), longitude(10222))>
>>> cf.write(x, 'mass_fraction_of_cloud_ice_in_air.nc')
>>> cf.write(y, 'MAX_mass_fraction_of_cloud_ice_in_air.nc')

$ du -h *mass_fraction_of_cloud_ice_in_air.nc
53G     mass_fraction_of_cloud_ice_in_air.nc
9G      MAX_mass_fraction_of_cloud_ice_in_air.nc
```

- cf-python is the library behind the **cfa** and **cfdump** tools for converting UM output to netCDF format and inspecting file contents

- The cf-python software is a useful python analysis tool