

The post-processing chain of GCFS seasonal forecast data for C3S

K. Isensee¹, K. Fröhlich¹, B. Früh¹, in collaboration with the C3S Seasonal Forecast team²

¹ Department Climate and Environment Consulting, Deutscher Wetterdienst (DWD)
² European Centre for Medium-Range Weather Forecasts (ECMWF)

Schematic description of the German Climate Forecast System

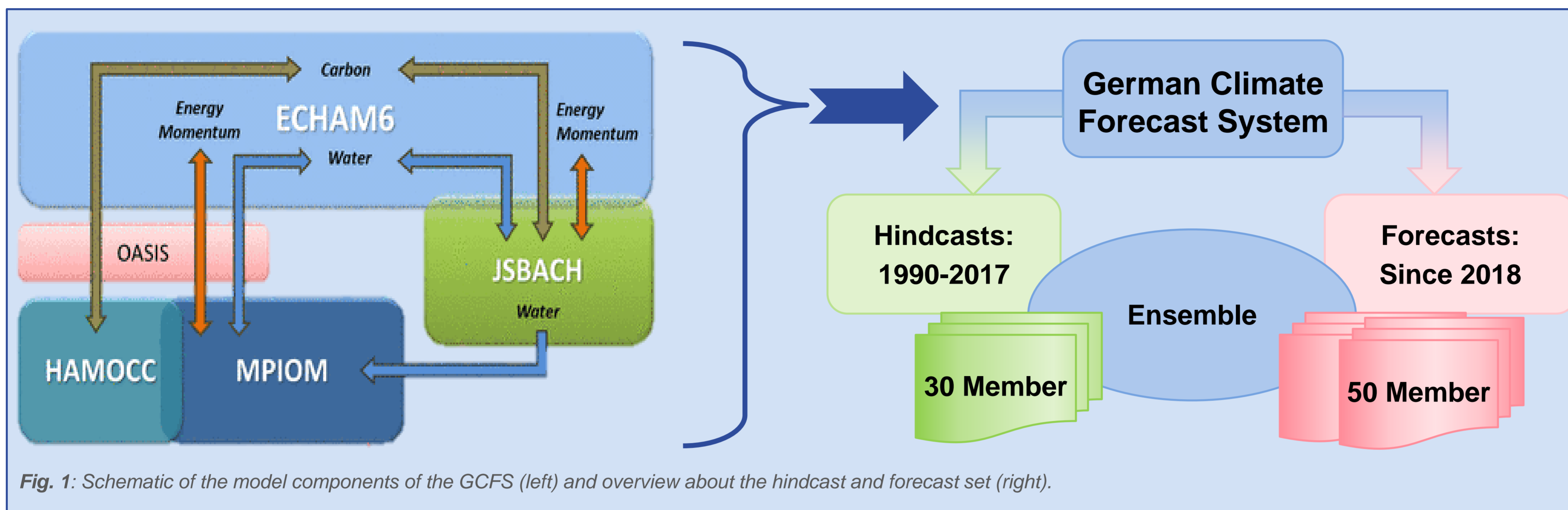


Fig. 1: Schematic of the model components of the GCFS (left) and overview about the hindcast and forecast set (right).

The Deutscher Wetterdienst (German meteorological service) contributes seasonal forecasts with its German Climate Forecast System (GCFS) to the Copernicus Climate Change Service (C3S). Through the C3S Climate Data Store GCFS data will be made available to users with different scientific backgrounds. For this purpose the forecast data output needs to be adjusted by the provider to the uniform data specifications which are particularly designed to satisfy the needs of this climate service according to C3S demands.

GCFS model configuration

Atmosphere: ECHAM6

- T127L95 (horizontal $\sim 0.9^\circ \times 0.9^\circ$, vertical 95 levels up in 0.1hPa)
- Land model JSBACH
- Hydrological discharge model

Ocean: MPIOM

- TP04L40 (horizontal $\sim 0.4^\circ$, and 40 vertical levels)
- Sea ice model
- Marine biogeochemical model

OASIS

- Hourly coupling between ECHAM6 and MPIOM



Copernicus Climate Change Service

The C3S is one of the six services provided by the European Union's earth observation program 'Copernicus' and is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF). Its purpose is to combine a variety of data to gain information about the past, current and future climate. The seasonal forecasts represent one aspect of the C3S and are provided by five European institutions.

Coordinates

- latitude/longitude/pressure
- depth/height
- realization
- reference time/leadtime/time
- bounds (lat/lon/depth/leadtime/time)

Variable attributes

- long_name/standard_name
- units/cell_methods/coordinates
- grid_mapping
- (valid_min/valid_max/_FillValue/missing_value)

Global attributes

- conventions
- title/references/source
- institute_id/institution/contact
- project/comment
- creation_date
- forecast_type/forecast_reference_time
- modeling_realm/frequency/level_type
- commit
- summary/keywords
- history

GCFS output

C3S specifications

Data provision

Seasonal prediction model of DWD

The German Climate Forecast System (GCFS) is a joint project between Universität Hamburg (UHH), the Max Planck Institute for Meteorology (MPI-M) and the Deutscher Wetterdienst (DWD). The forecasts and hindcasts of GCFS are provided to C3S. Features of the model are displayed in Fig. 1 and in the model configuration.

C3S data specifications

Requirements for the seasonal forecasts:

- spatial resolution of 1x1 degree on a lonlat grid
- temporal resolution of 6h, 12h or 24h depending on the variables
- variable and global attributes
- NetCDF4, compressed and shuffled
- checksums for secure file transfer

Documentation of unique features

Model specific features of the produced data need to be documented to avoid misinterpretation. Common differences to other models can be:

- variables defined for a certain height or depth
- soil layer schemes
- specific interpretation of variable fields (e.g. snow depth, see Fig. 2)

Constrained by CF conventions

Similar to other specifications (SPECS and CMIP5/6)

Uniform data format:
C3S NetCDF specifications

Add some attributes recommended by ACDD

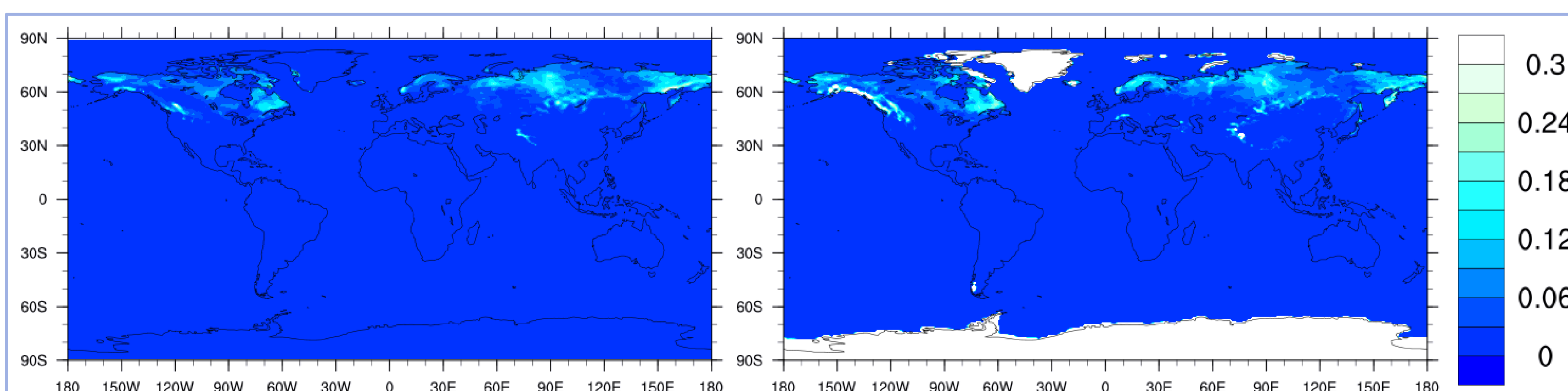


Fig. 2: Forecasts of snow depth in [m] for January 1, 2018. In GCFS (left) the snow depth over glacial areas is assumed to be infinite and therefore not calculated. On the other hand the IFS (right) assumes the snow depth over glacial areas to be constantly 10m. Range of the values is cropped for better visibility of lower values.

