The Met Office GloSea5 System

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Current status of contribution to S2S

- data conversion on the way
- data transfer method/script being tested
- preparing update to the operational suite to output some of the S2S variables not yet available
- testing conversion and transfer with Frederic Vitart
- description of forecasting system imminent

On track to start transfer of (subset of) operational data around end of June.
Variables not yet ready for distribution

Still requiring work:

- Soil Temperature (top 20cm and top 100cm)
- Soil Moisture (top 20cm and top 100cm)
- Time-Integrated Surface Latent Heat Flux
- Time-Integrated Surface Net Solar Radiation
- Time-Integrated Surface Net Thermal Radiation
- Time-Integrated Surface Sensible Heat Flux
- Time-Integrated Surface Solar Radiation Downwards
- Time-Integrated Surface Solar Surface Thermal Radiation Downwards
- Time-Integrated Top Net Thermal Radiation
- Potential Vorticity
- Snow Depth Water Equivalent
- Convective Precipitation
- Total Column Water

Currently not available in the operational suite:

- Convective Available Potential Energy
- Eastward Turbulent Surface Stress
- Northward Turbulent Surface Stress
- Snow Albedo
- Snow Density
- Soil Type (?)
- Vertical Velocity
- Water Runoff and Drainage
Global Seasonal Forecast System version 5 (GloSea5)

• ensemble prediction system
• the source for Met Office monthly and seasonal forecasts
• uses a coupled model (atmosphere—land-surface—ocean—sea-ice)
• regular updates
• linked to model development cycle (~ yearly)
• hindcasts computed in near-real time
GloSea5 operational system – current configuration

Model version: **HadGEM3 GC2.0 (UM / NEMO / CICE / OASIS)**

Resolution: **N216L85 O0.25L75** (mid-lat: ~60 km atm.)

Forecast length: 7 months (seasonal),
                2 months (sub-seasonal)

Hindcast period: **1996-2009 (14 years)**; hindcast run in real time

Model uncertainties represented by stochastic physics

Initial conditions uncertainties represented by a lagged ensemble
Global Coupled modelling configuration

GC2.0

N216 (~60km)

ORCA025
Initialisation of the system

**Forecast (initialised daily):**
- Atmosphere & land surf *: Met Office NWP analysis (4d-Var)
- Ocean & sea-ice: NEMOVAR (3d-Var joint system for ocean, med-range, monthly and seasonal)

**14-year hindcast (1996-2009):**
- Atmosphere & land surf *: ERA-interim
- Ocean & sea-ice: NEMOVAR
- Fixed start dates of 1\textsuperscript{st}, 9\textsuperscript{th}, 17\textsuperscript{th}, 25\textsuperscript{th} of each month
- 3 members per start date

* Soil moisture set to climatological average
**GloSea5 forecast schedule**

**Seasonal Forecast:**
- 2 members run each day.
- Seasonal forecast updated weekly by pulling together last 3 weeks (i.e. 42 members)

**Monthly Forecast:**
- 2 additional members run each day.
- Monthly Forecast updated daily by pulling together last 7 days (i.e. 28 members)

**Hindcast (for monthly-seasonal):**
14 year hindcast *run in real time* (42 members run each week = 14 years x 3 members)
Future plans
Plans in brief

- new supercomputer (arriving in stages)
- new model version (GC 3.0)
- longer/larger hindcast (22 years, 7 members/start time)? – depending on funding
- higher horizontal resolution (N512)? – depending on results of comparison to be conducted this summer

- storm tracking code (TRACK) in operational suite
- coupled initialisation for seasonal forecasts? – depending on tests to be conducted later this year

Some details follow
Global Coupled modelling configuration

**GC3.0**

- **ORCA025**
- **N216 (~60km)**
- **Global Ocean** 6.0
- **Global Sea Ice**
- **Global Land**
- **Global Atmosphere** 7.0
- **JULES**
- **NEMO**
Global Coupled 3.0
(to be tested for initialised forecasts around end of 2015)

GC3 will be the basis of UK Earth System Model (UKESM) 1.0.

• GC3 = GlobalAtmos7 + GlobalLand7 + GlobalOcean 6 + Global Sea-Ice 7/8

• GA: UKCA-MODE aerosols
• GA: Stochastic Physics (SKEB+SPT)
• GL: Multilayer snow scheme
• GO: Non-linear free surface
• GO: Freezing temperature based on salinity
• GSI7: Embedded sea-ice
• GSI8: multilayer thermodynamics
Horizontal resolution upgrade
N512 ORCA 1/4

Preliminary tests this summer using GC2.

2 initialisation dates, 5 members. Comparison of N216 and N512.

More seasonal hindcasts in late 2016.

Operational implementation in 2017-2018.
Other plans

Storm tracking code, TRACK, in operational HPC suite.

- Some of the TRACK processing has been moved into the UM already, reducing the time required to calculate tracks in post-processing.
- We want to move more of the tracking process to the operational suite.

Coupled initialisation for seasonal forecasts.

- Met Office have developed a weakly-coupled data assimilation system based on GC2.
- This system will become a demonstration operational suite this year.
- Seasonal tests will be carried out towards end of 2015 and it will eventually be used to initialise GloSea forecasts.
- No plans for coupled re-analysis.
The end