**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación

EXCELENCIA
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OCHOA

EC-Earth Climate Prediction Working Group

Etienne Tourigny

and the Climate Prediction Group at BSC

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Climate Prediction Working Group
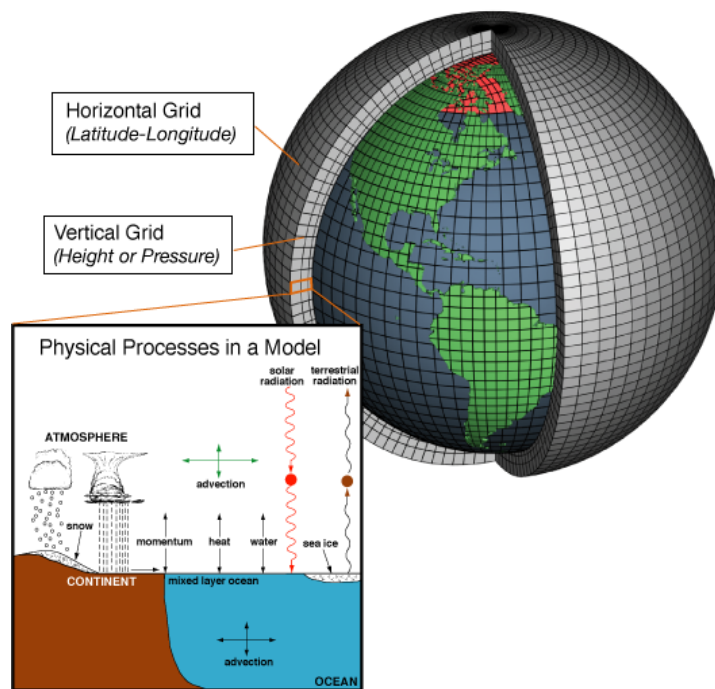
- https://dev.ec-earth.org/projects/ecearth3/wiki/Climate_Prediction_Working_Group

- WG mailing list : ecearth.climate.prediction@bsc.es

- Terms of reference
  - To **tune** the EC-Earth 3.2 version in standard and high resolutions **in seasonal prediction mode**
  - Coordinate the participation of the EC-Earth consortium to **DCPP**
  - Develop **initialization** and ensemble generation techniques, **share initial conditions** to others
  - Assess climate forecast **quality** on sub-seasonal to decadal timescales
  - Investigate **sources and mechanisms** of predictability

- Experimental protocol for tuning in seasonal prediction mode
  - Run 5-member 4-month-long seasonal predictions initialized Nov. from 1993 to 2009
  - One 10-year-long simulation to be run by BSC at the end of the tuning process

- Repository for initialization, ensemble generation and verification tools

- Repository for initial conditions – at BSC, ECMWF and JASMIN (soon)

Status of EC-Earth3.2 at BSC

- T255L91/ORCA1L75 : Runs in seasonal prediction mode

- T511L91/ORCA025L75 : fixed many issues - bathymetry, closed seas

- Initial Conditions available for climate prediction runs

- PRIMAVERA & HighResMIP output: ongoing (E. Tourigny)

- BSC & SMHI : MetOffice decadal semi-operational experiment

- DCPP : awaiting for proper EC-Earth version (external & internal)

DCPP – Decadal Prediction at BSC

- Initial Conditions:
  - prepared by BSC (atmosphere, ocean, sea ice)
  - for all years 1960-present
  - 4 start dates : **November**, February, May, August
- Component A : Decadal hindcasts (6000 years)
  - Every year from 1960-present
  - Starting in November of every year
  - 10 members (BSC) / 1-2 Members (DMI)
  - 5 year predictions, extended to 10 years
- Component B : Semi-operational decadal forecast (100 years)
  - 10 years x 10 members
- Component C3 : Volcano effects on decadal prediction (M. Menegoz)
- "Extra" seasonal prediction hindcasts
  - Use the first months of the decadal runs initialized in November
  - Run short (4 month) predictions initialized in February, May, August
- High Resolution Hindcasts (optional, 3000 years)
  - 5 members, IF we obtain the hours from PRACE (as part of ENES) and only after we have completed everything else (HiResMIP and DCPP standard)

CPWG Breakout session

- Recent progress by other groups ?

- Plans for climate prediction experiments
  - ENEA : DCPP & seasonal prediction sensitivity to vegetation, investigate ensemble initialization (anomaly vs. full field)
  - DMI : 1-2 members DCPP component A
  - SMHI : investigate ensemble initialization ?
  - Oxford : stochastic perturbations schemes for PRIMAVERA, maybe for seasonal prediction

- Using a workflow manager (Autosubmit) for climate prediction experiments
  - ENEA showed interest for DCPP
  - We can assist any other interested groups

- Open question : which version to use & tuning strategy ?

- Recommendations from ECMWF
  - 5 members not enough for proper tuning in seasonal prediction mode, maybe OK for drift analysis
  - recommend we move away from ERA-Land for land surface initialization and develop an assimilation strategy
  - Compare skill at 500 mb vs. surface, in ECMWFS4 better skill at 500 mb

Thank you!

For further information please contact
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Climate Prediction Workflow

5-member prediction started 1 Nov 2014

5-member prediction started 1 Nov 1970

5-member prediction started 1 Nov 1965

5-member prediction started 1 Nov 1960

… every year …

Observations

1960

2015
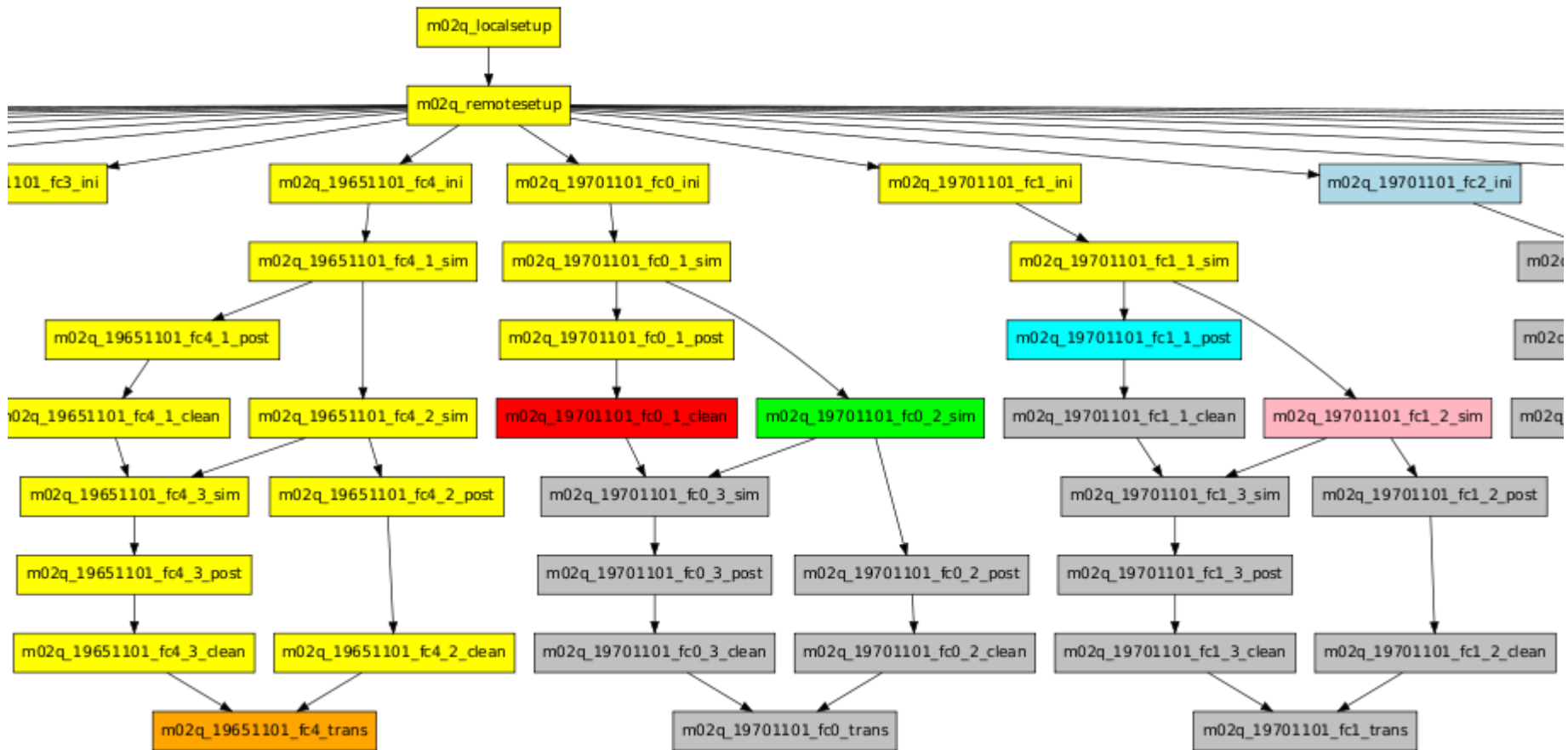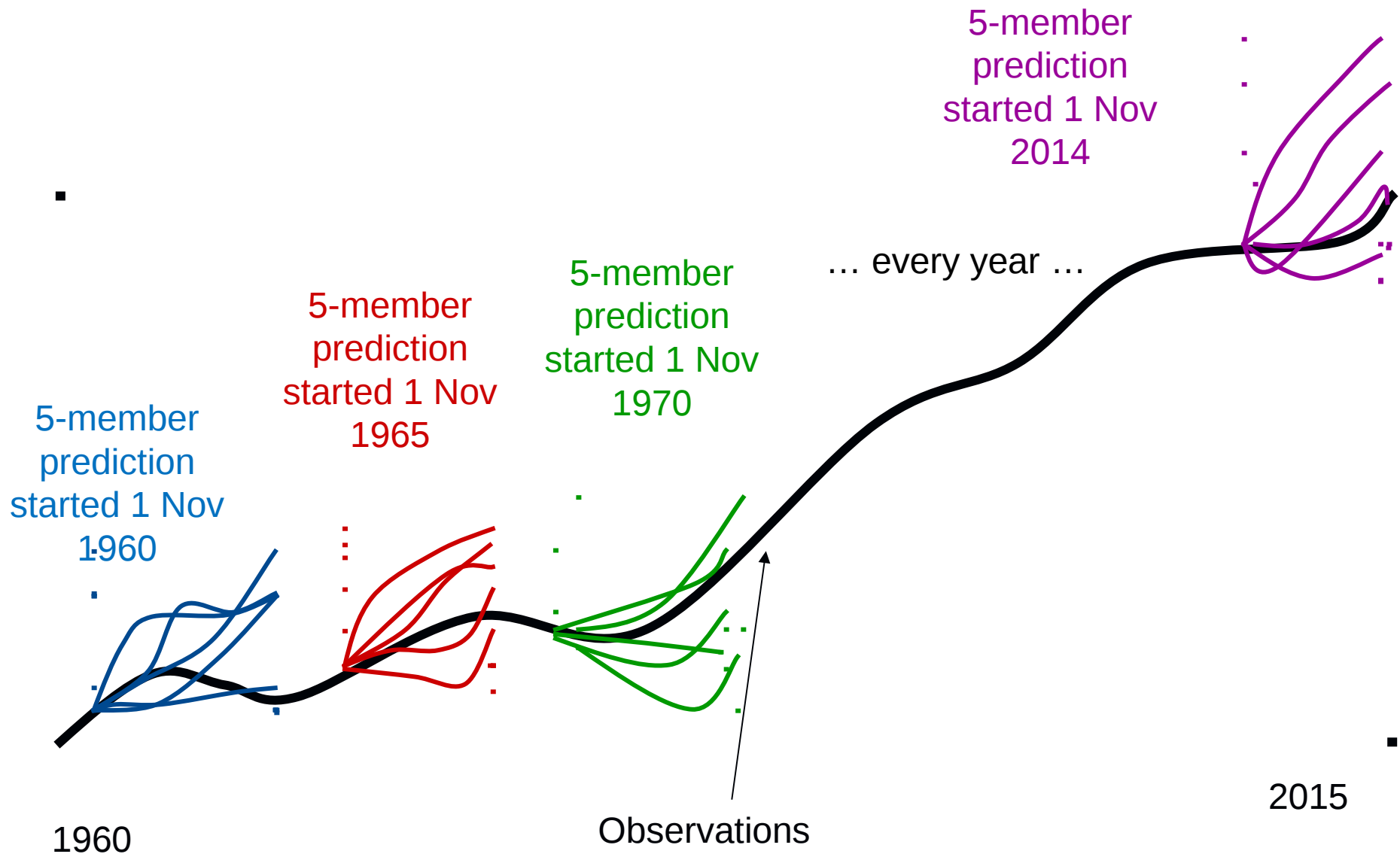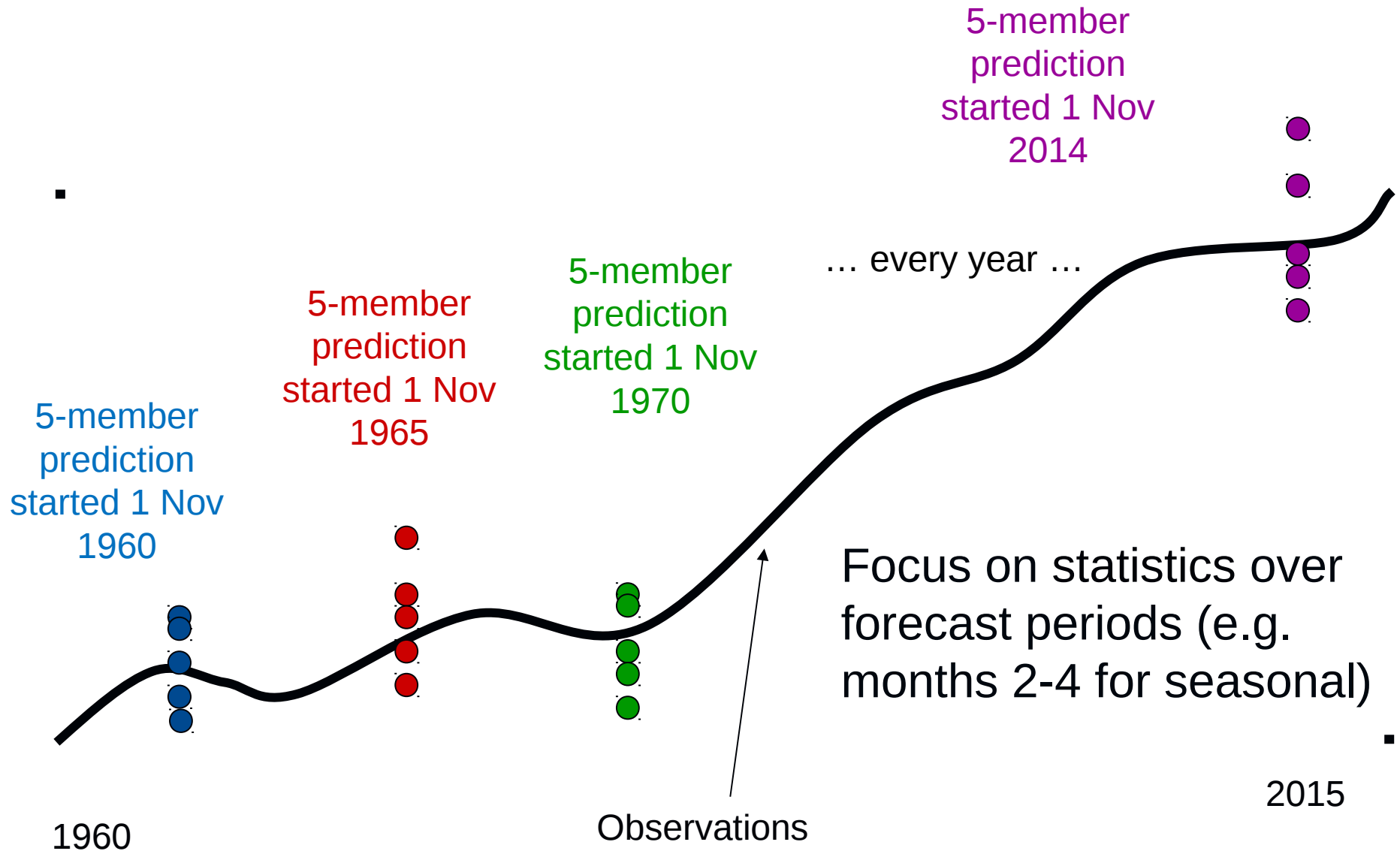
Climate prediction experiments

- # Atmosphere:

  - Atmospheric initial conditions generated using FULLPOS for three different resolutions of IFS. FULLPOS conducts a physical interpolation using the model executable and therefore ensures little model drift.

  - The initial conditions are prepared for periods:

    - 1960 - 2015 using ERA-40 (1960-1978)

    - ERA-Interim (1979-2015)

    - ERA-Land (1979-2015) - forced by GPCP, replaces surface model fields

  - 10-member (SST perturbation), Start dates each year in February, May, August, November

  - T511L91 & T255L91 resolutions

  - **We can produce more on demand!!!**

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Initial conditions for climate prediction

- Ocean:
  - ORAS4 interpolated/extrapolated 5-member restarts in the configuration ORCA1L75 covering the 1958-2013 period, at ECFS ec:/c3y/restarts_ORAS4
  - Many more available, and more can be produced easily

- Sea Ice:
  - 5-member ORCA1 reconstruction covering the 1958-2006 period = i056 at ECFS ec:/c3y/restarts_i056
  - 5-member ORCA1 reconstruction covering the 1979-present period = i057 at ECFS ec:/c3y/restarts_i057
  - 1-member ORCA025 reconstructions covering the 1958-2006 period = m063 at ECFS ec:/c3n/restarts_m063
  - 1-member ORCA1 reconstruction covering the 1958-2015 period = a05p
  - 24-member ORCA1 reconstructions with sea ice data assimilation (done using NEMO only), covering 1979-1999 (still ongoing): a0a9
  - 24-member ORCA1 reconstructions with sea ice data assimilation (done using EC-Earth), covering 1993-1995 (still ongoing, to be updated because major bug was found, ticket 289 on this portal) = a09p

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