Impact of initialisation on the reliability of decadal predictions

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Venice, 6 February 2019

EUCP European Climate Prediction system

BSC Barcelona Supercomputing Center Centro Nacional de Supercomputación

EXCELENCIA SEVERO OCHOA

Related tasks

Task 5.1: Providing guidance on the use of existing global climate predictions systems for regional predictions

Task 5.2: Explore and test a range of methodologies for generating multi-model seamless uncertainty quantifications for climate predictions at the regional scale using global initialised and non-initialised simulations

Initialised decadal predictions (INIT) vs. non-initialised projections (NoINIT)

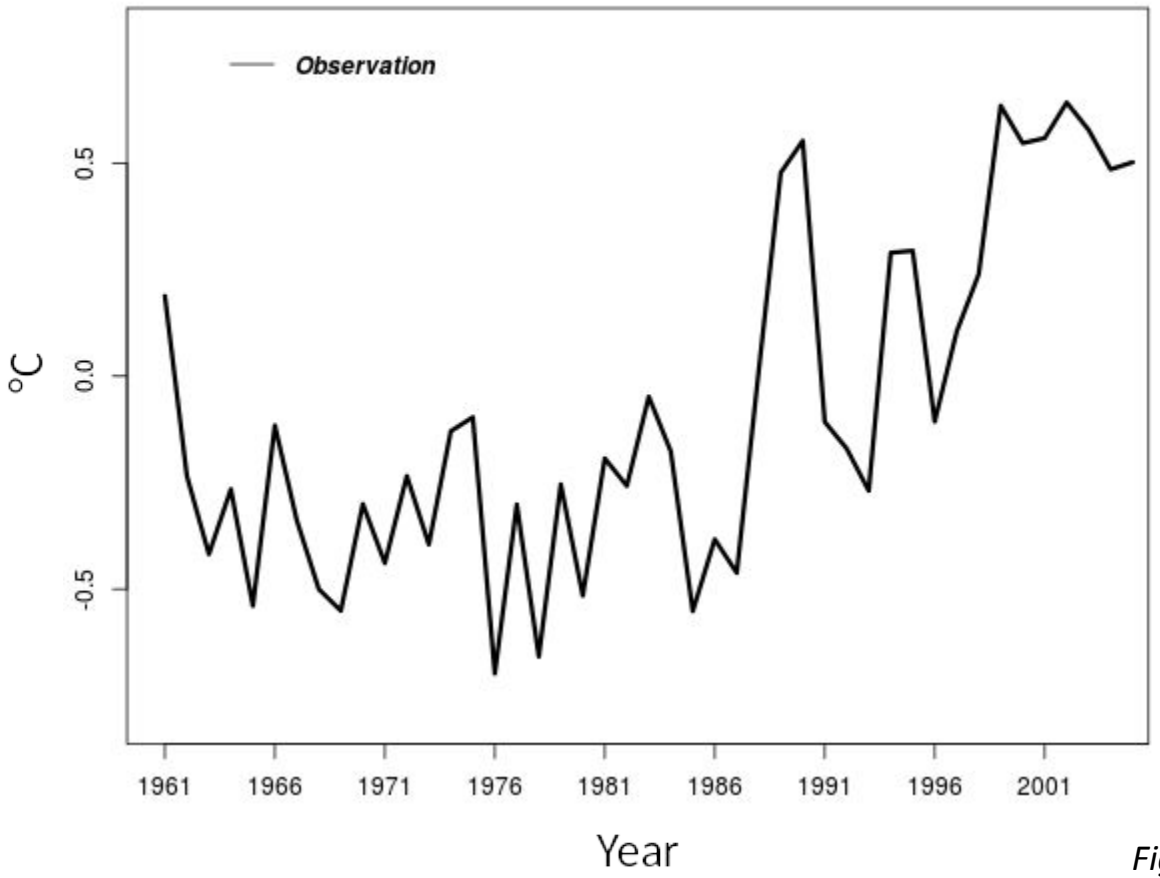
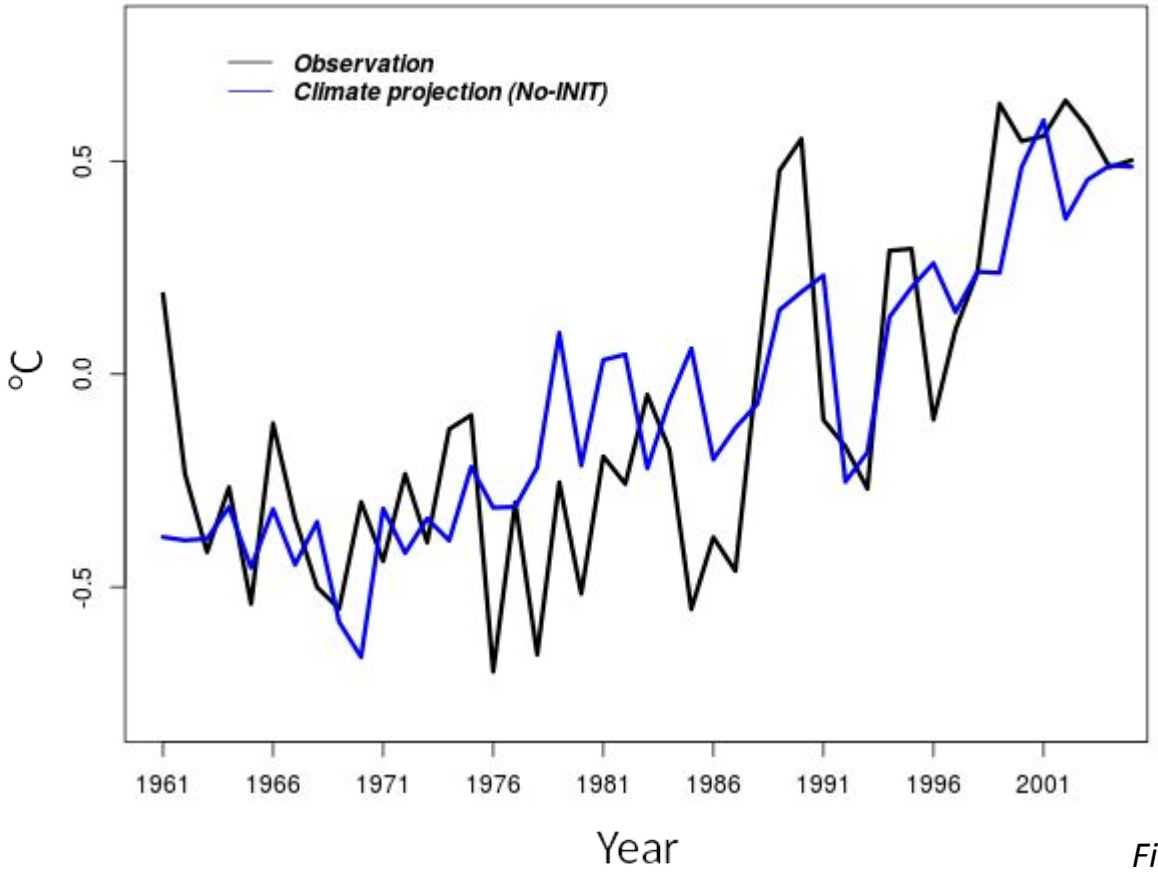


Figure: B. Solaraju Murali

Initialised decadal predictions (INIT) vs. non-initialised projections (NoINIT)



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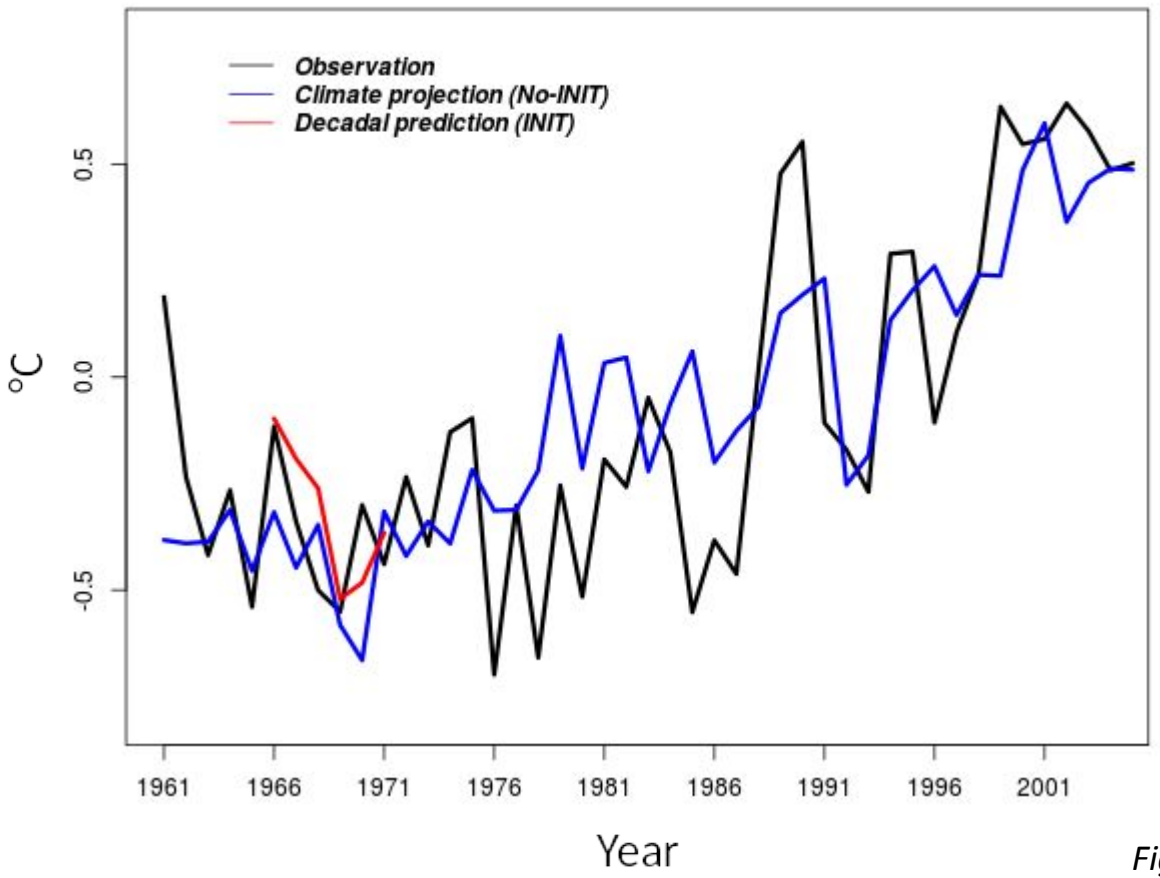

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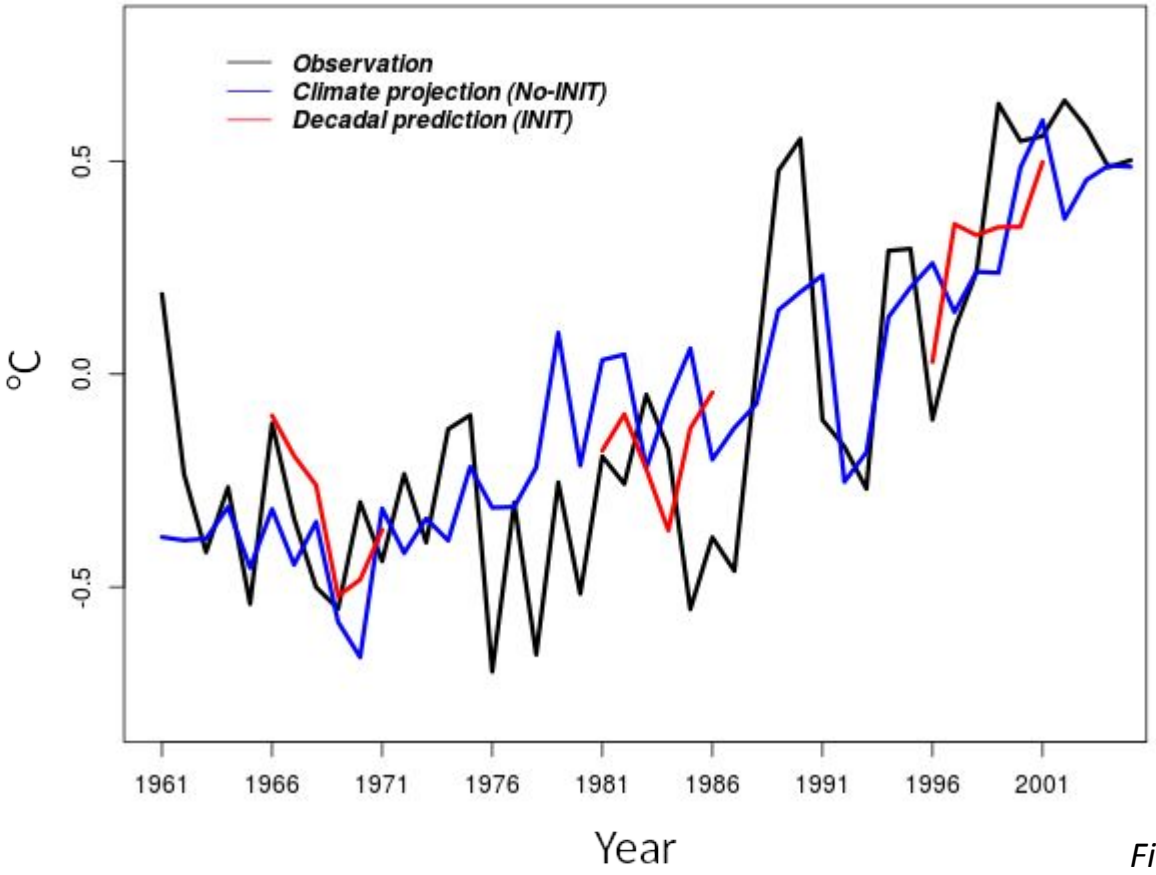

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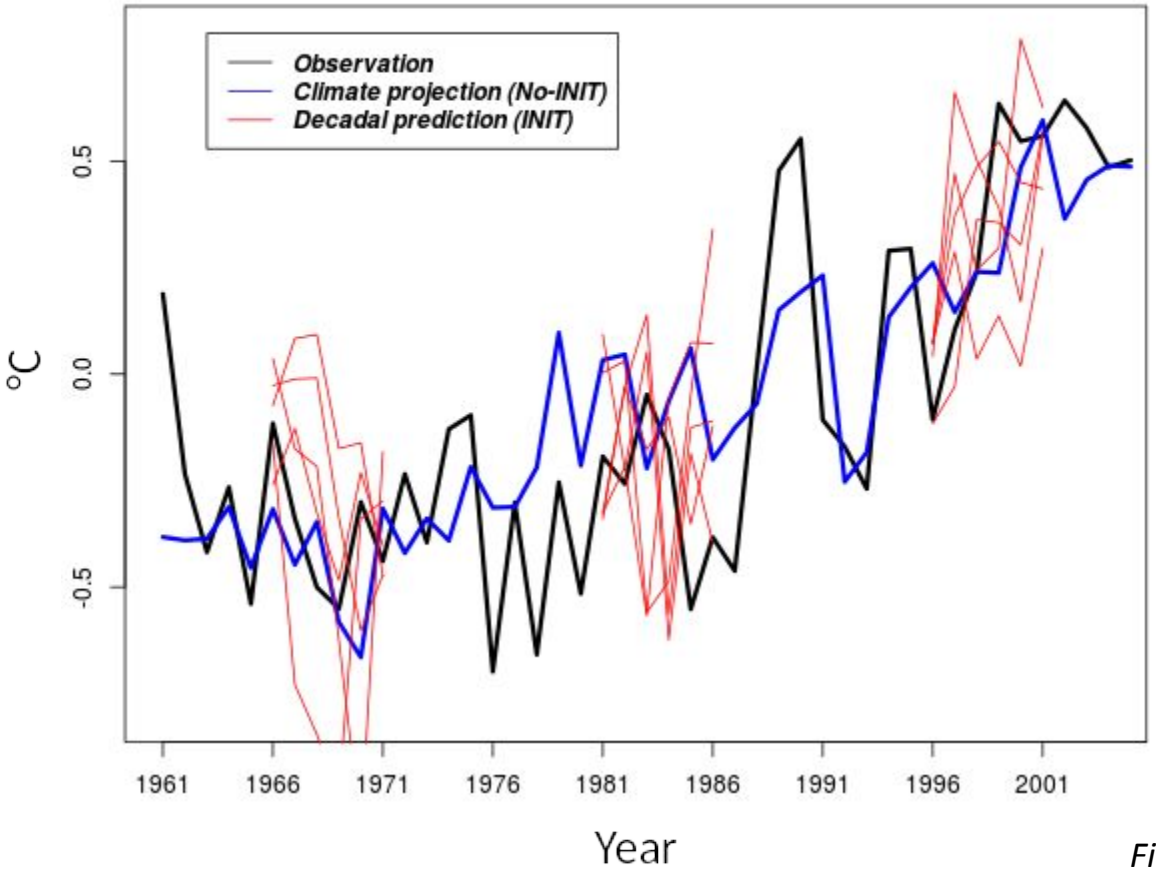


Figure: B. Solaraju Murali

Comparison between INIT and NoINIT

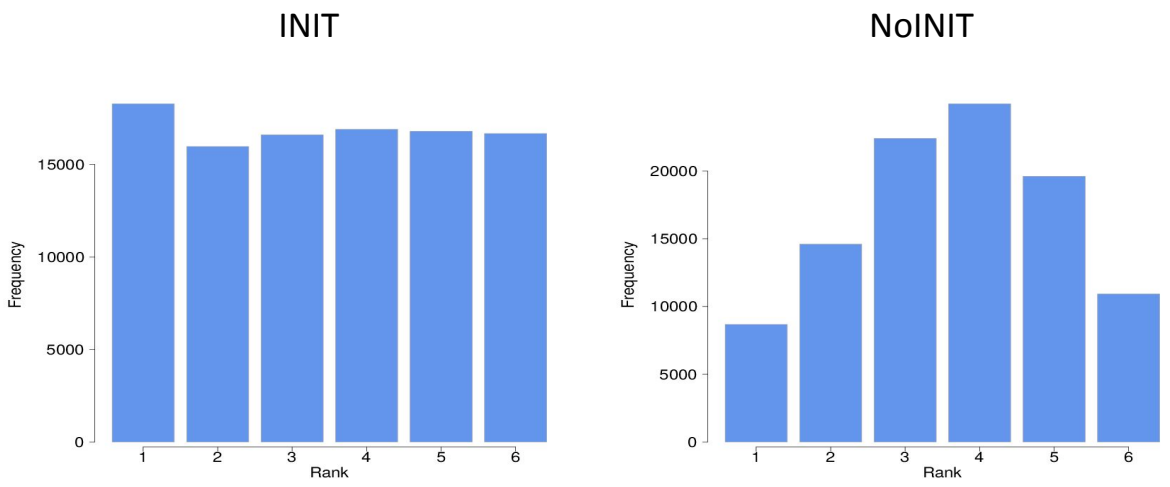
Generally done in terms of forecast quality (skill scores)

Here: impact of initialisation in terms of **reliability**
= agreement between the predicted probabilities and observed relative frequencies of a given event

Different tools:

- **rank histograms**

Precip, European region
1960-2005, Forecast year 1
EC-Earth 2.3, 5 members
Observations: GPCC v7



Verfaillie et al., in prep.

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Different tools:

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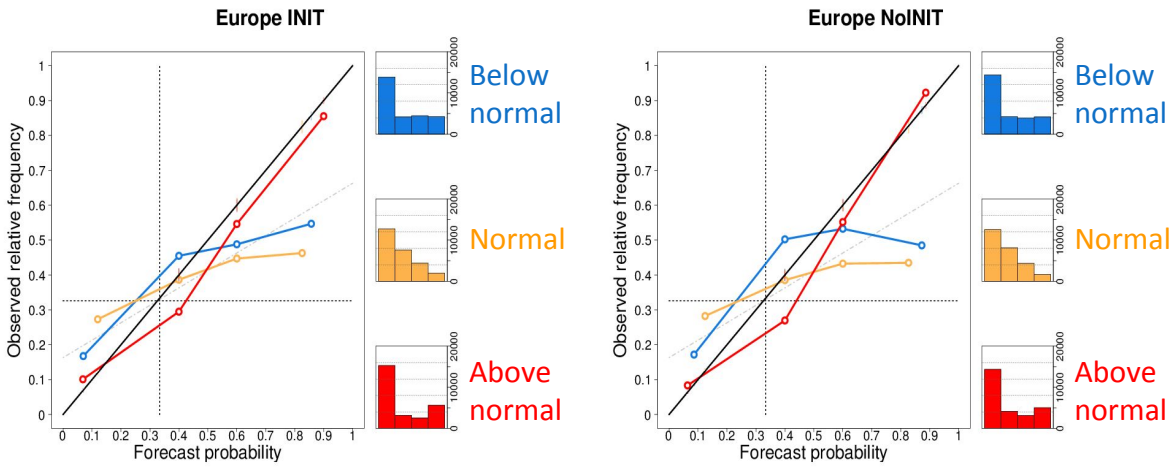
- **reliability diagrams**

T, European region
1960-2005, For. years 1-5
EC-Earth 2.3, 5 members
Observations: GISSTEMP



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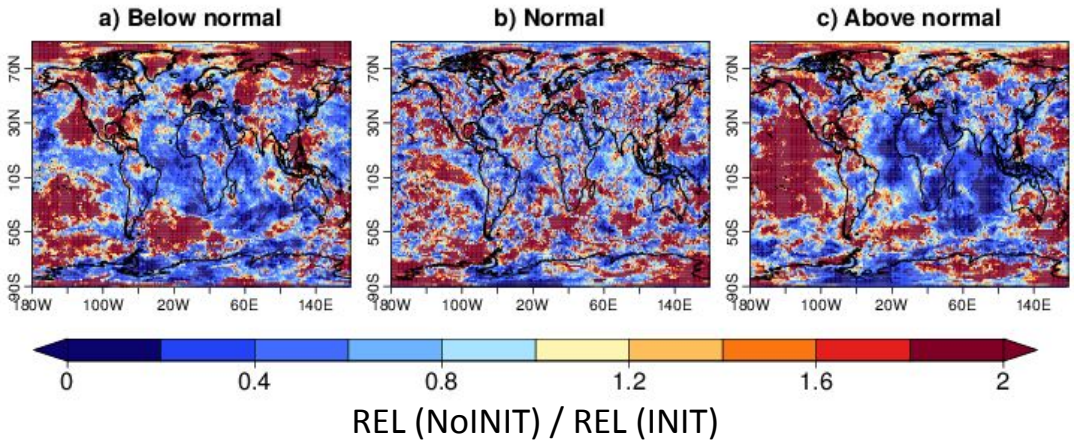
Different tools:

- rank histograms
- reliability diagrams
- **REL from Brier score**

Sea-level pressure
1960-2005, Forecast year 1
EC-Earth 2.3, 5 members
Observations: JRA 55



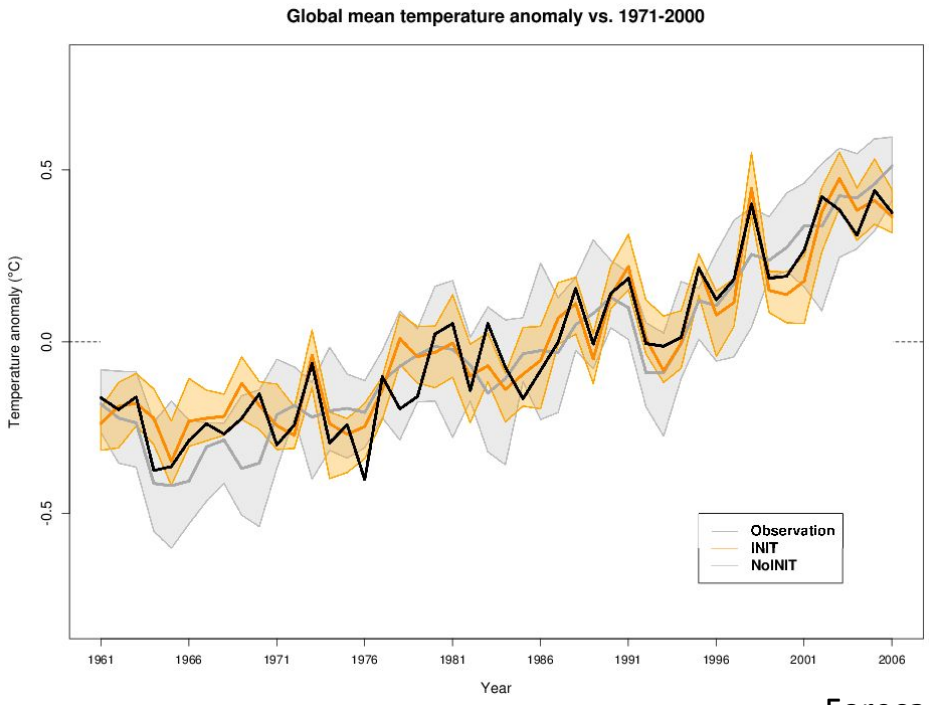
Verfaillie et al., in prep.

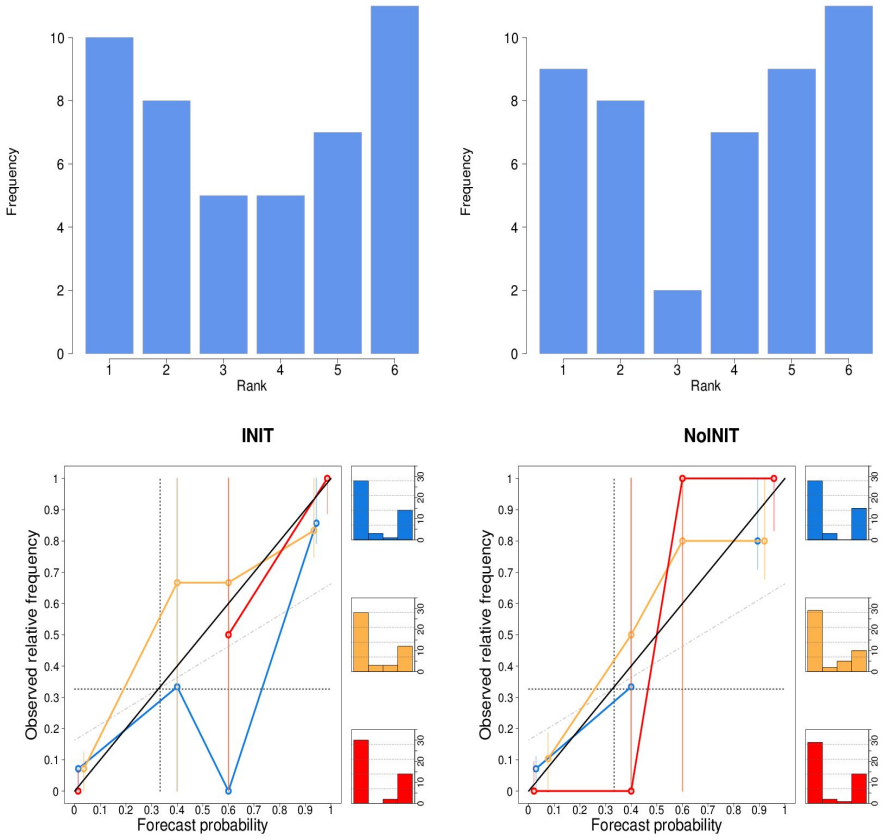
Results - EC-Earth only

- **Analysis of T, Precip, sea-level pressure**
  → **T reliable over Europe**, less true for Precip & sea-level pr.
  → Generally, INIT is **more reliable** than NoINIT
  → But depends on the variable, the location, the temporal average, …
  → Generally clearer in rank histograms than in reliability diagrams
  → Slight impact of using different **subsets of ensemble members** for NoINIT (5 members to choose from 11)

Results - EC-Earth only

- **Analysis of indices: GMT**





Forecast year 1

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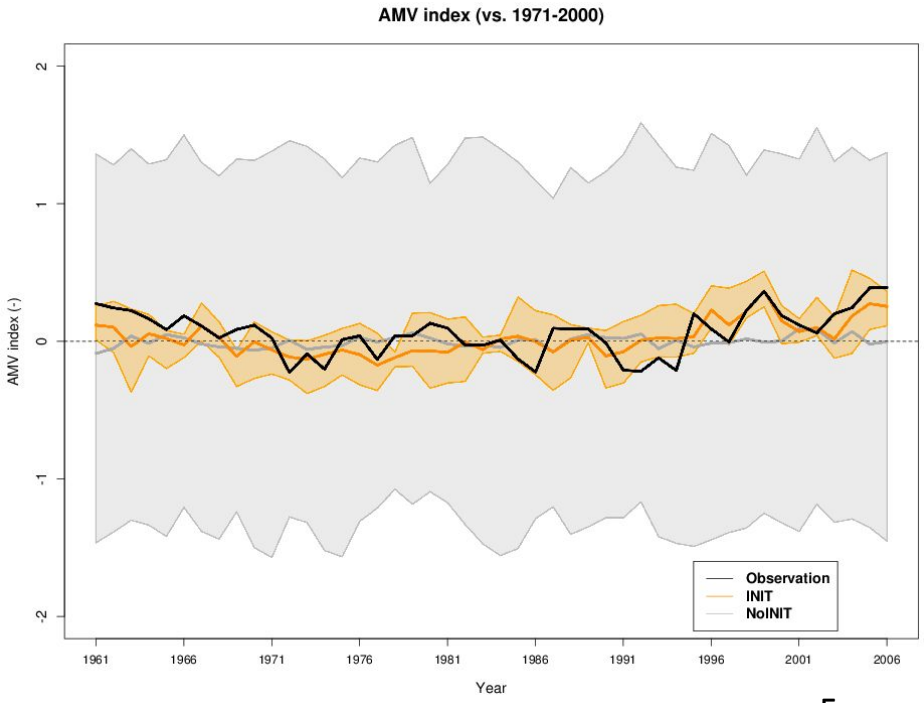
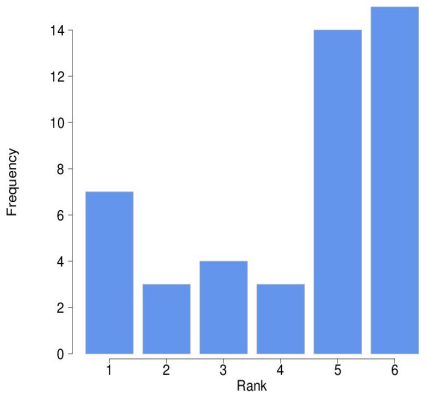
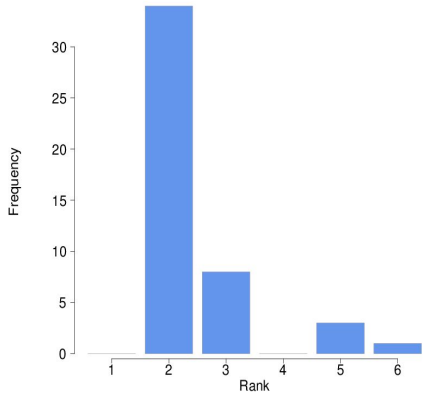
Small sample size→ difficult to conclude on the reliability

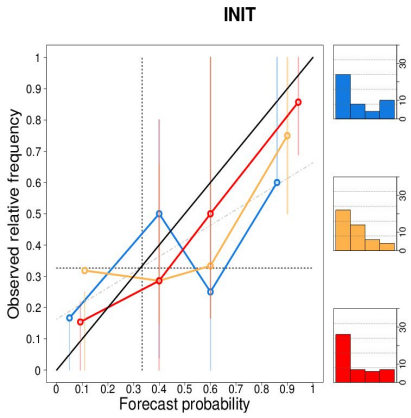
Results - EC-Earth only

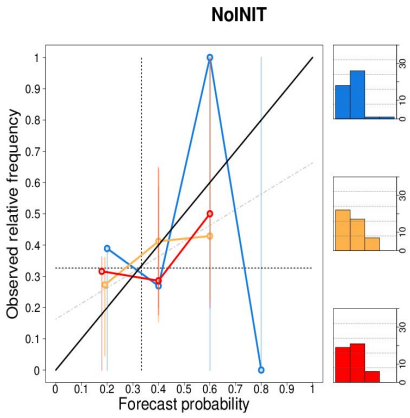
- **Analysis of indices: AMV**
  (Trenberth and Shea, 2006)











Forecast year 1

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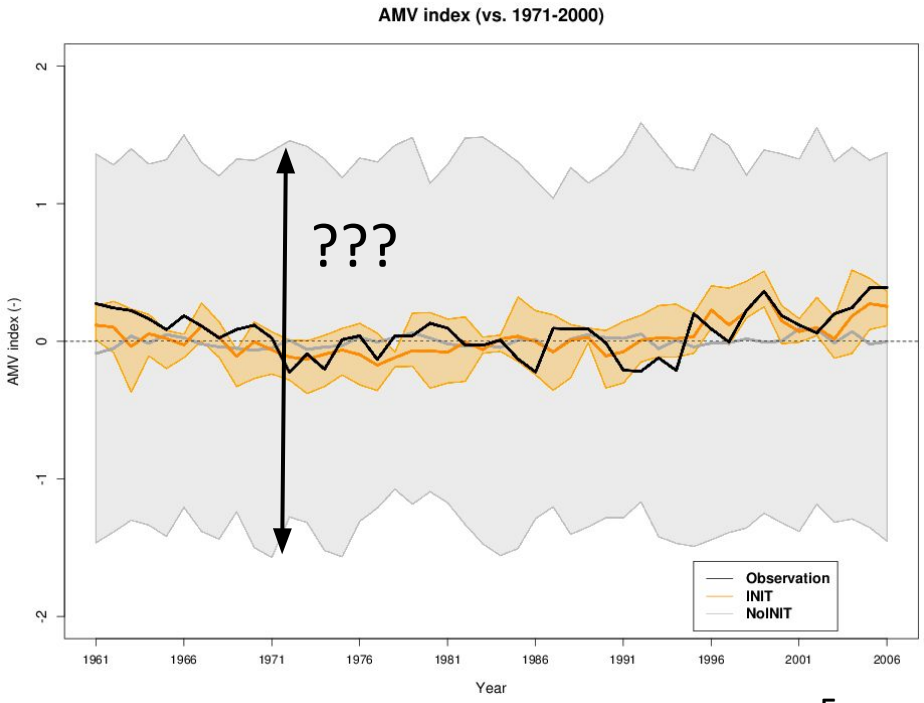

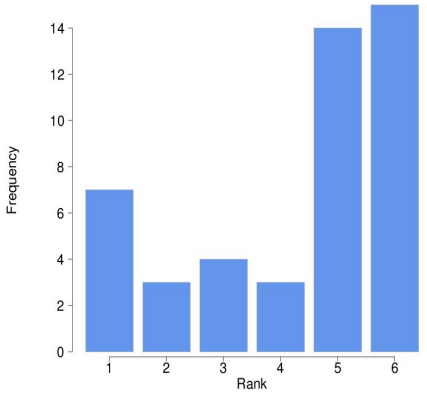

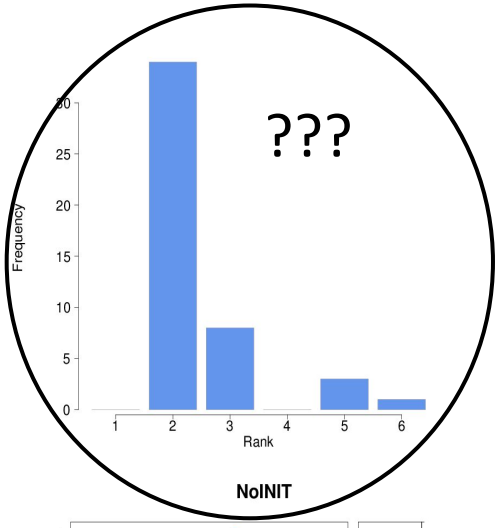

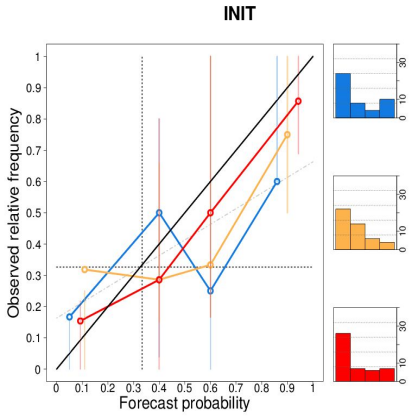

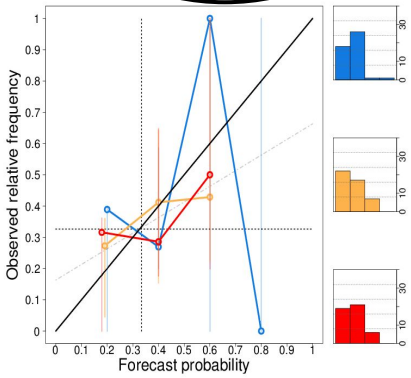

Forecast year 1

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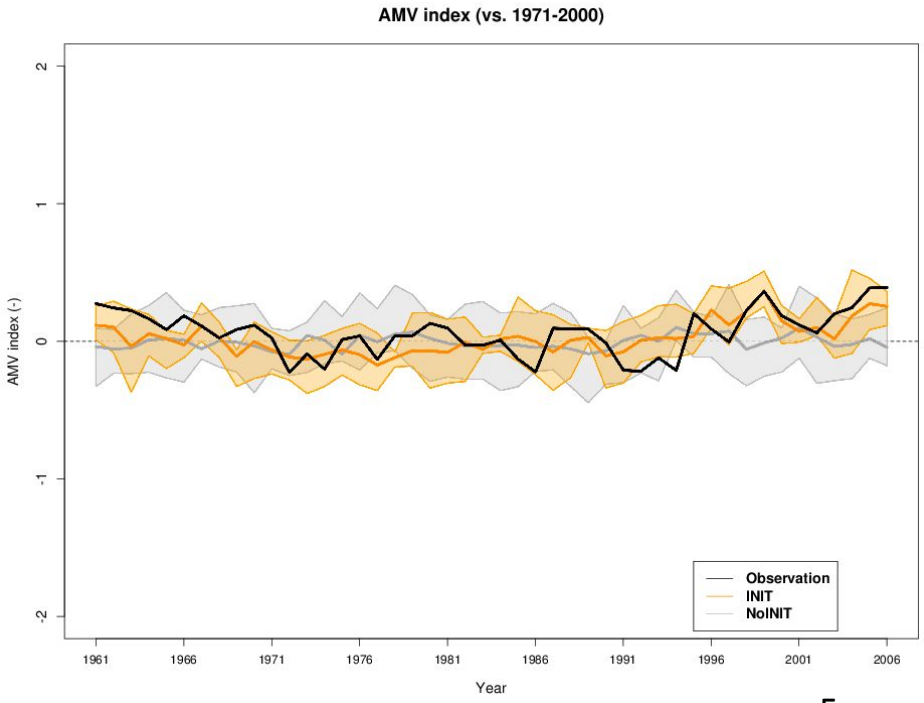
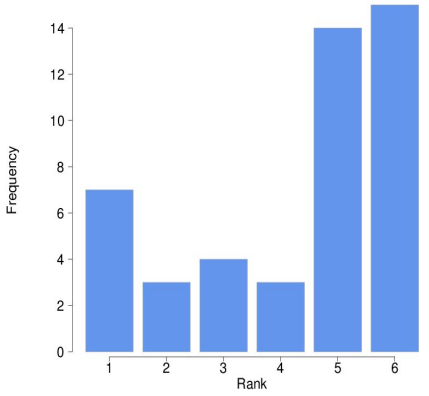
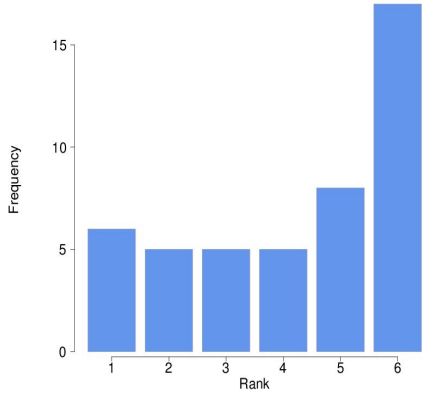
NoINIT subset 1

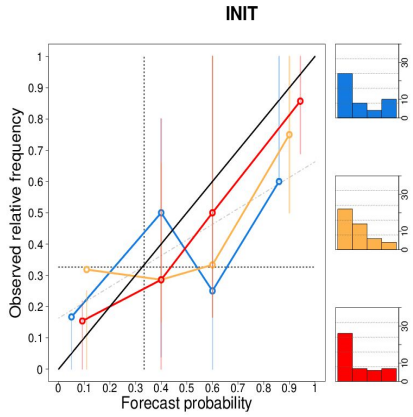
Results - EC-Earth only

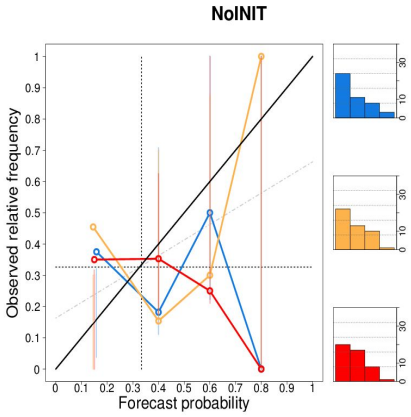
- **Analysis of indices: AMV**
  (Trenberth and Shea, 2006)











Forecast year 1

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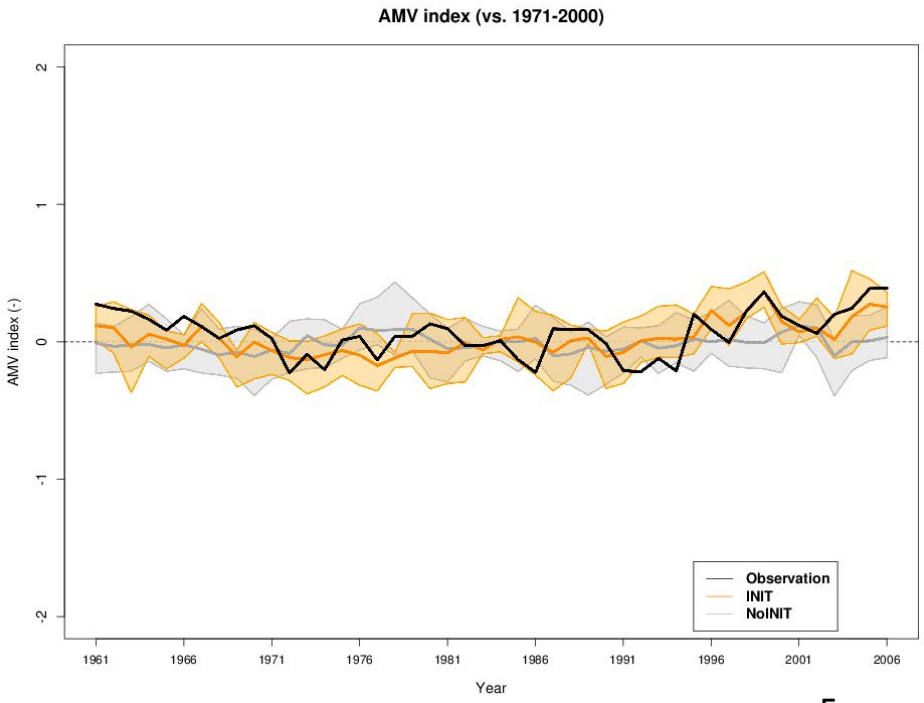
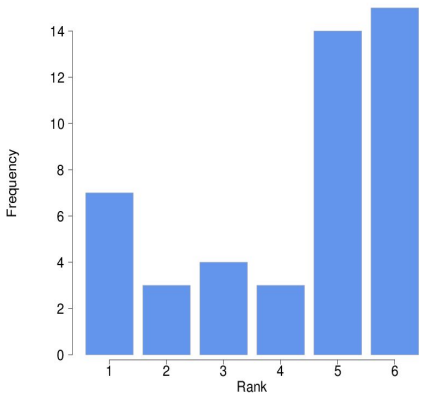
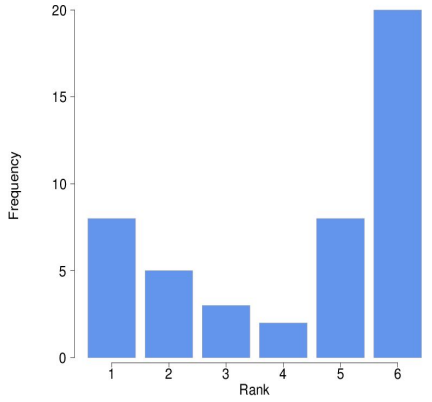
NoINIT subset 2

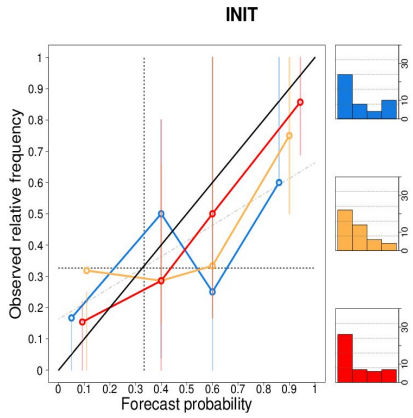
Results - EC-Earth only

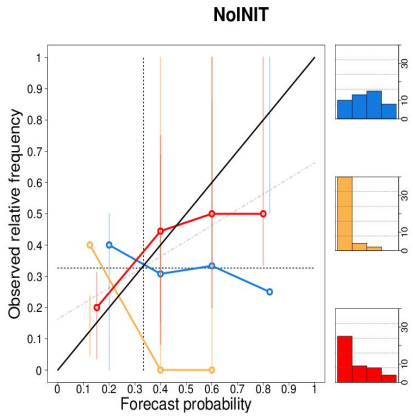
- **Analysis of indices: AMV**
  (Trenberth and Shea, 2006)











Forecast year 1

NoINIT subset 3

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Work in progress - Multi-model

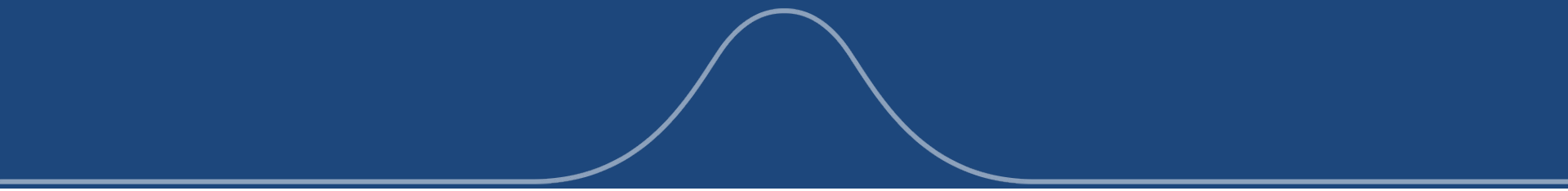
- 6 CMIP5 models + 3 from SPECS, both INIT & NoINIT runs (⚠ use same ensemble size), 1961-2005 → **11 “models”**

- Start by computing indices: GMT & AMV

Plans for the coming year

- Finish the **multi-model analysis**
- Submit a **paper** on this
- Work on methodologies to **merge INIT and NoINIT**

Thanks

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