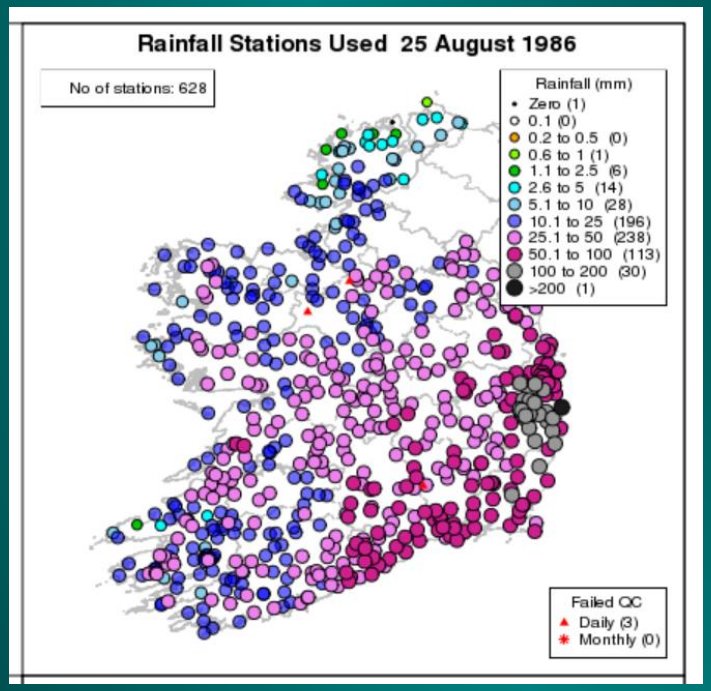
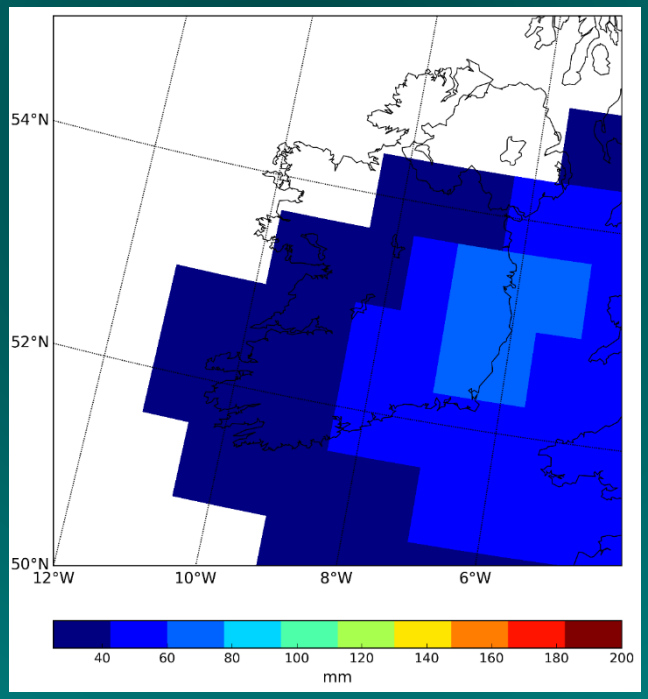
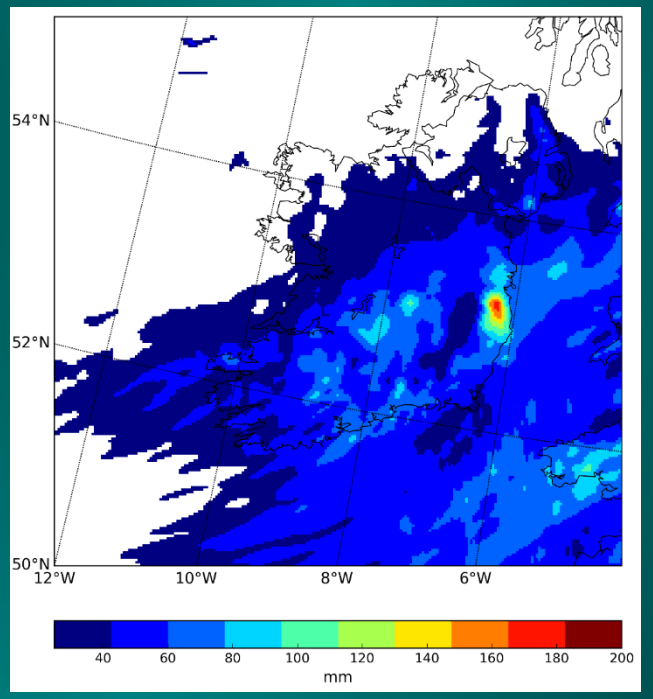
High resolution regional reanalysis over Ireland using HARMONIE-AROME

Emily Gleeson, Eoin Whelan
Met Éireann, Ireland







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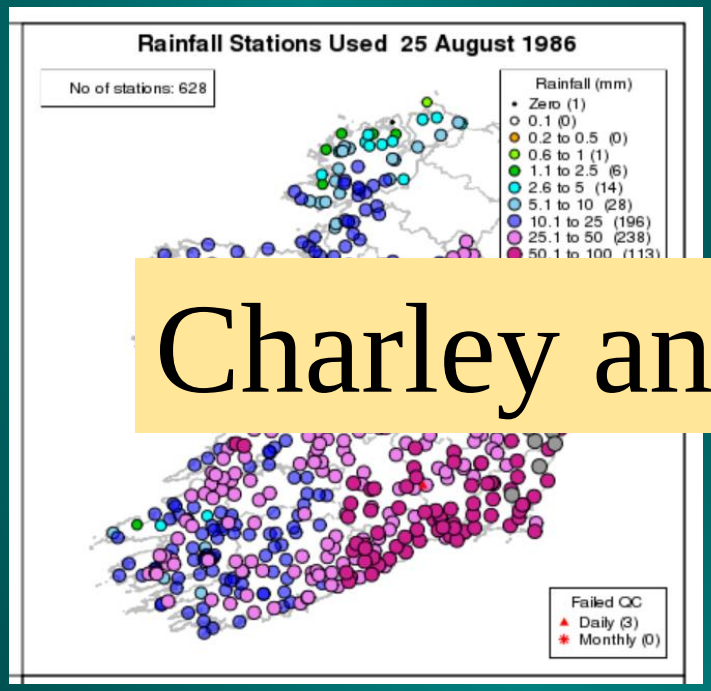

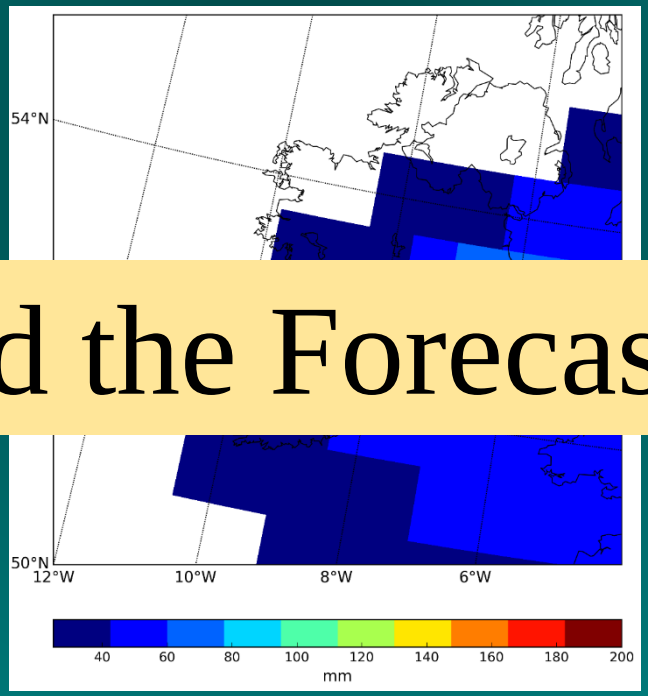

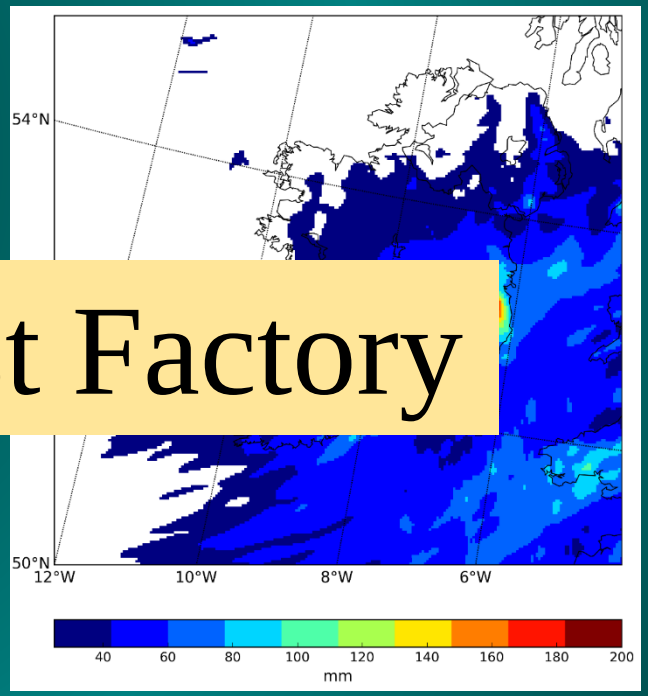

Charley and the Forecast Factory

1. Reanalysis Motivation

- No high resolution reanalysis dataset available for Ireland
- Extend the knowledge gained from observations
- Parameters that are physically consistent and often not routinely observed
- Important for climate monitoring
- Validation of the model

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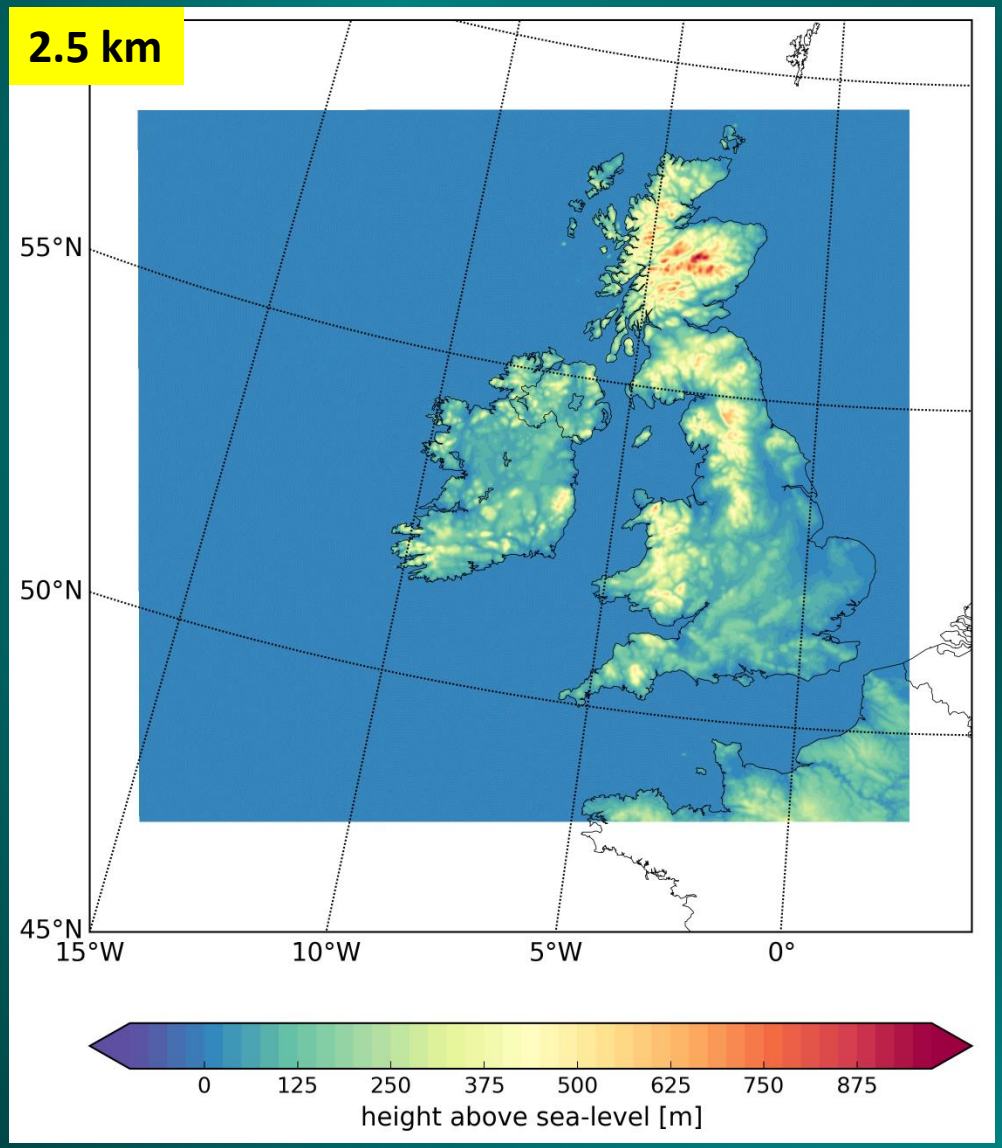
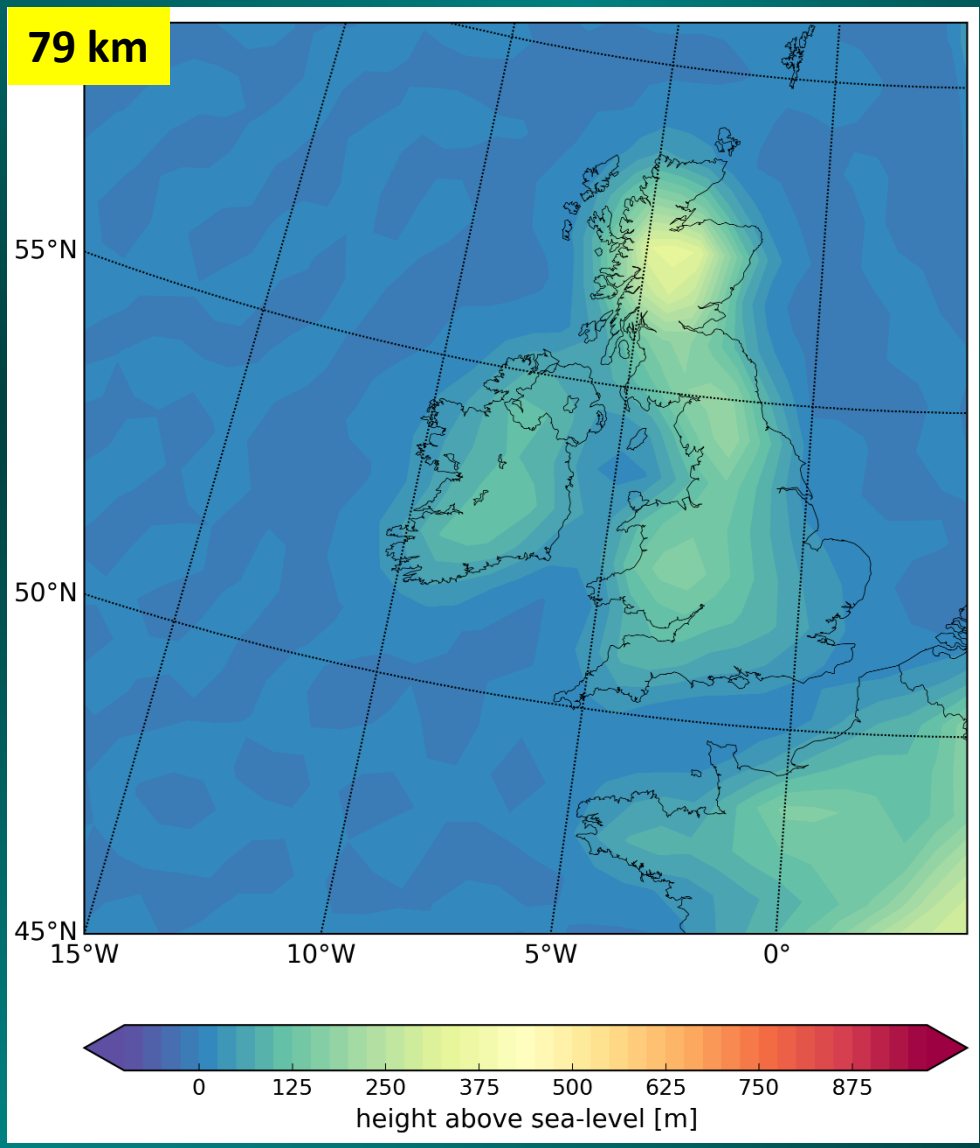
2. HARMONIE-AROME vs ERA-Interim Orography





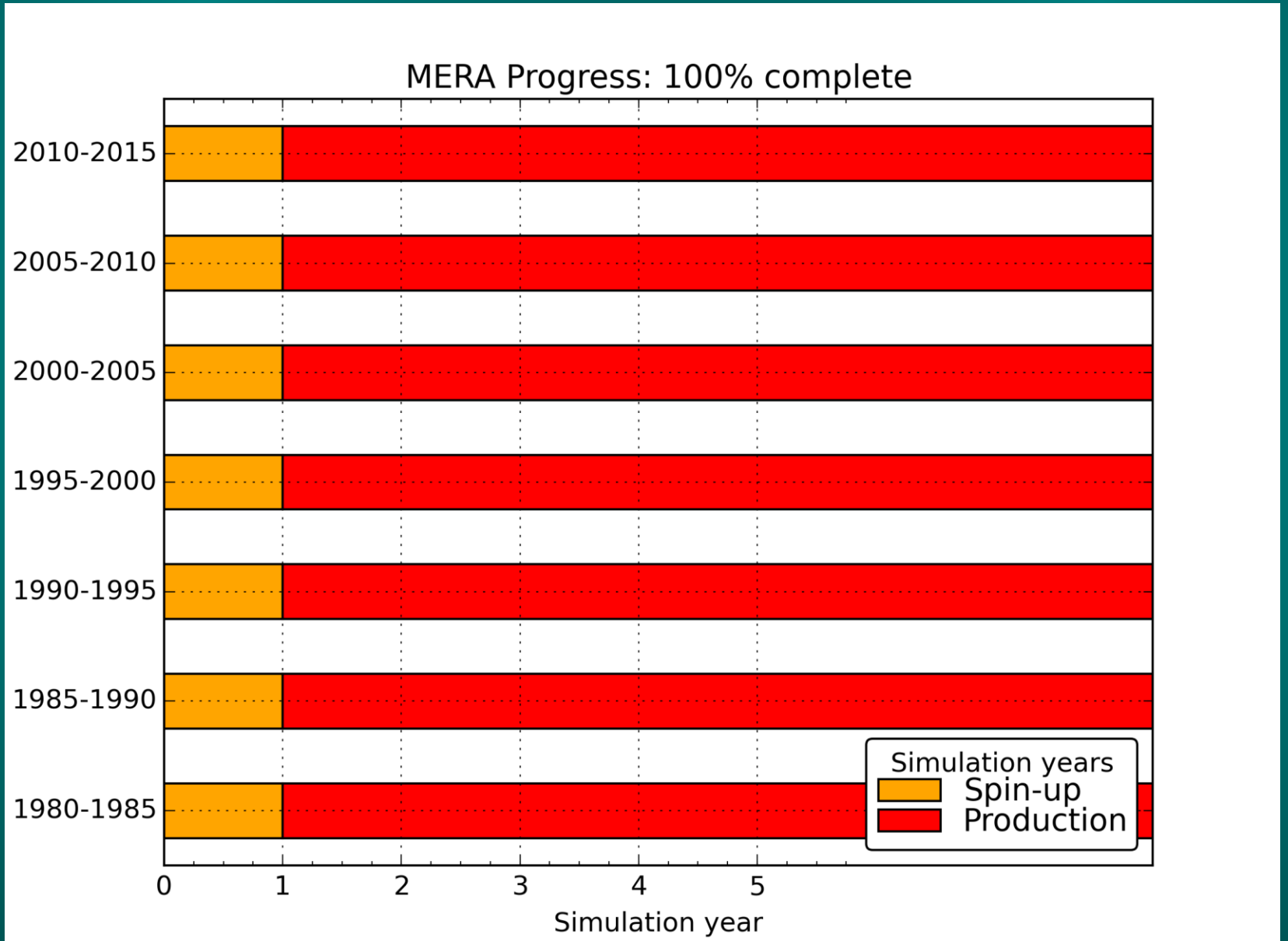
3. HARMONIE-AROME configuration

Model version	HARMONIE-AROME 38h1.2
Domain	540 x 500 grid points (Δx =2.5 km)
Vertical levels	65 levels up to 10 hPa, first level at 12 m
Forecast cycle	3 hours
Data assimilation	Optimal interpolation for surface parameters 3DVAR assimilation for upper air parameters
Observations	Pressure from SYNOP, SHIP and DRIBU Temperature and winds from AIREP and AMDAR Winds from PILOT Temperature,winds and humidity from TEMP
Forecast	3 hour forecasts, but a 33-hour forecast at 00 Z

4. A few points about MÉRA

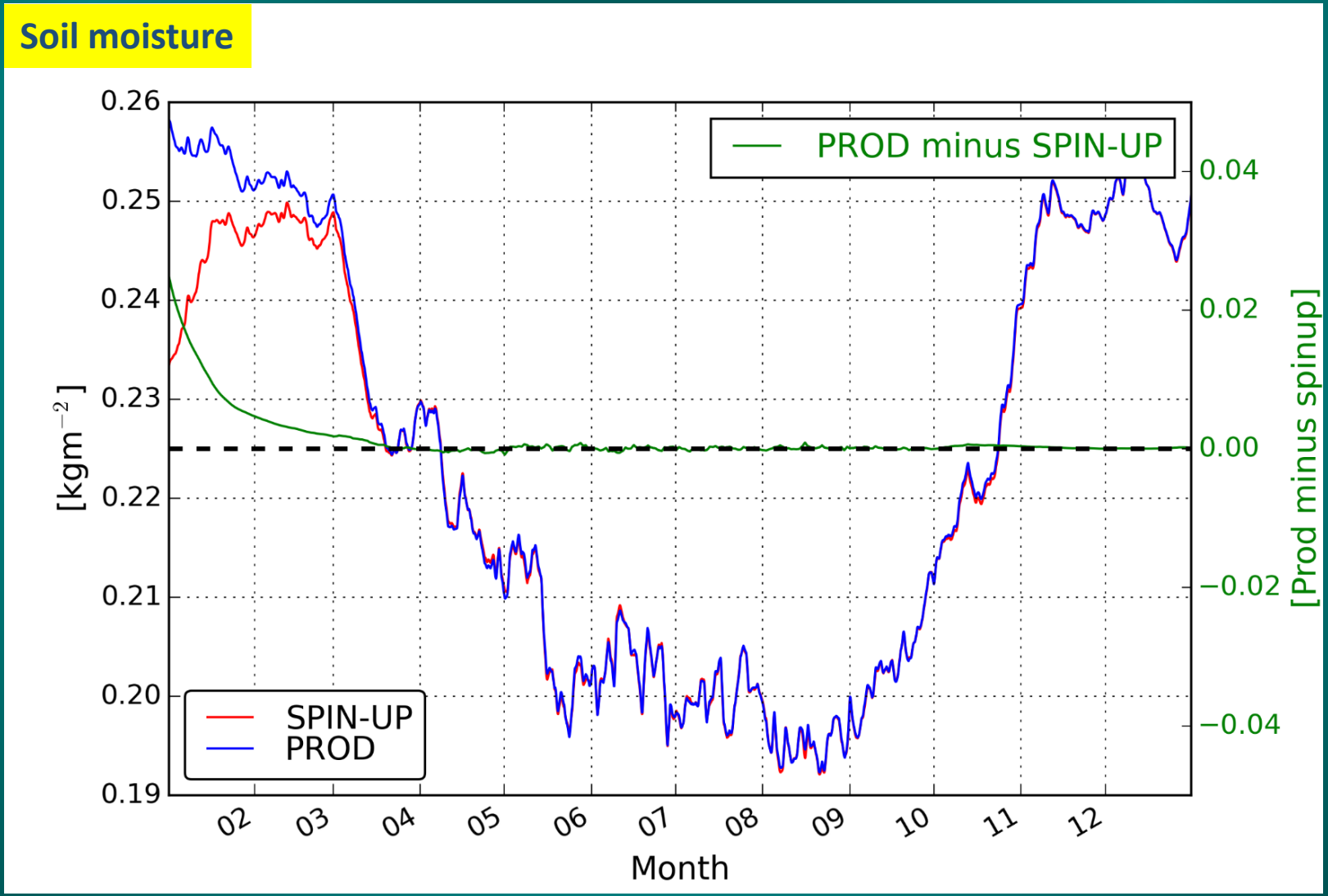
- MÉRA – Met Éireann ReAnalysis
- 35 year period: 1981-2015
- Conventional observations (available in MARS) are assimilated
- ERA-Interim lateral boundary conditions (every 3 hours using 1 way nesting)
- Tuning of surface drag coefficient used by SURFEX
- Atmospheric, near surface and surface parameters
- Running at ECMWF (cca) and stored in ECFS [200 TB]

5. Simulation summary



6. How long to spin up the model?

20 cm: 7 reanalysis streams – consistency important



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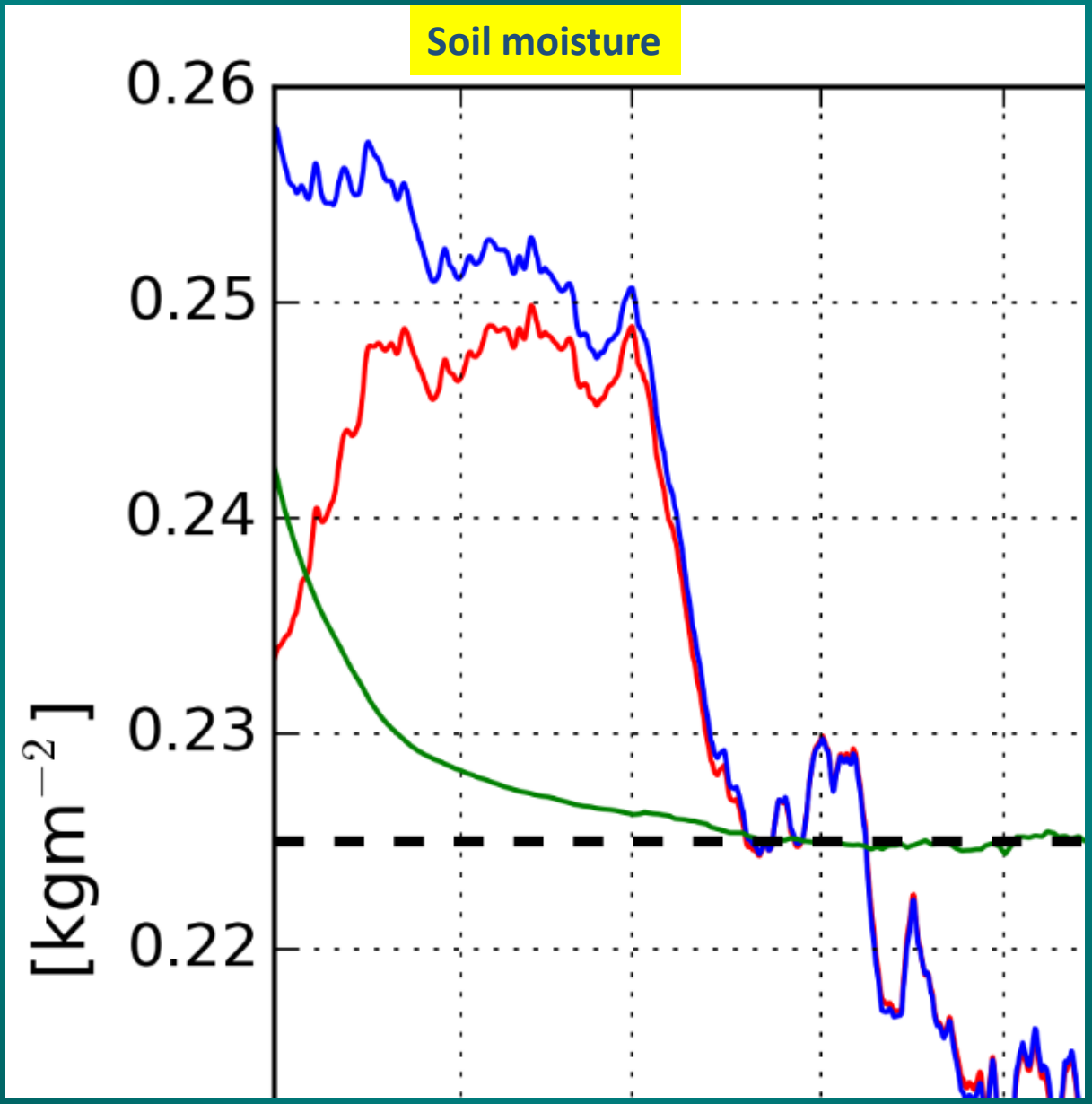

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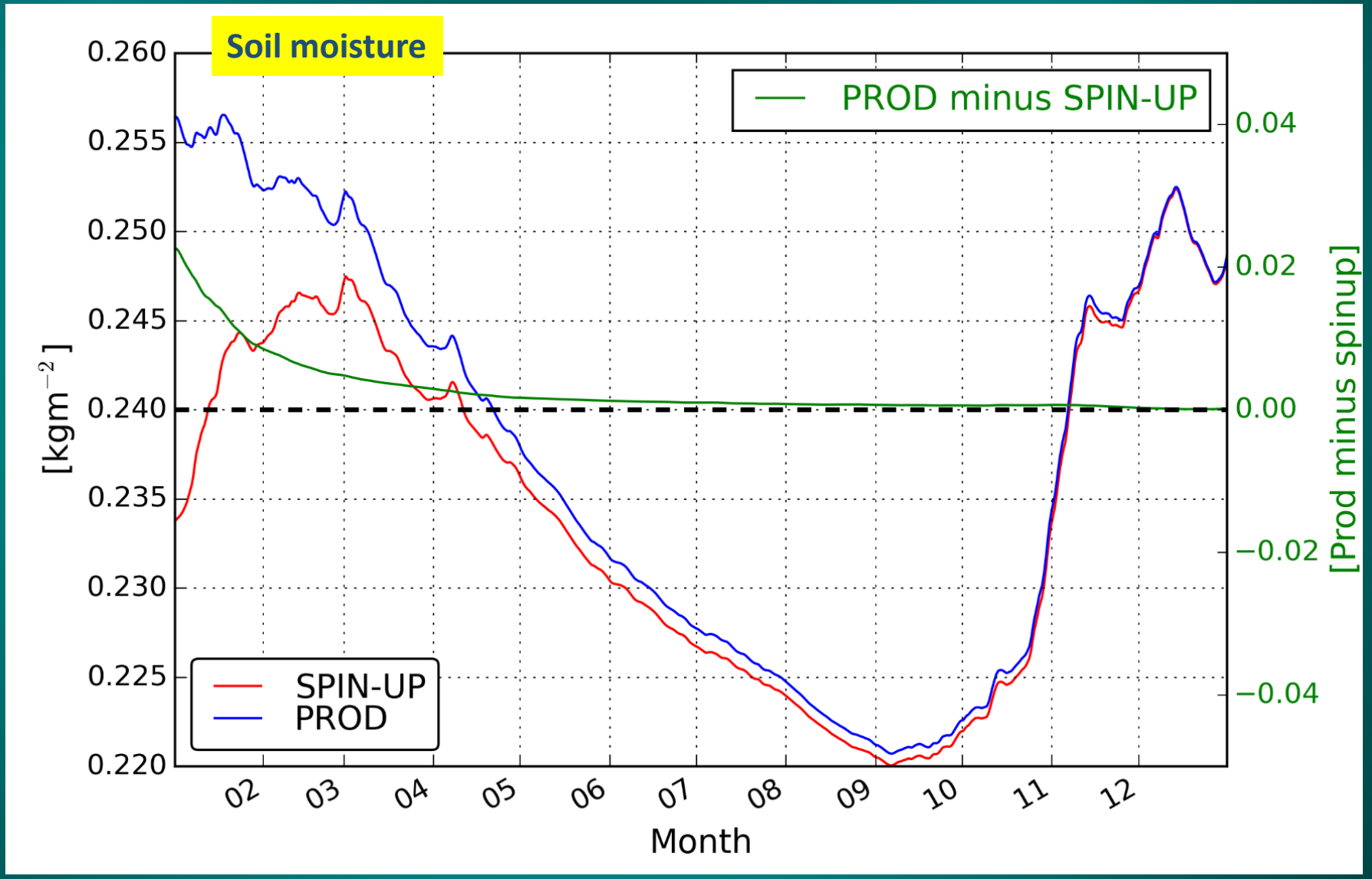
300 cm:



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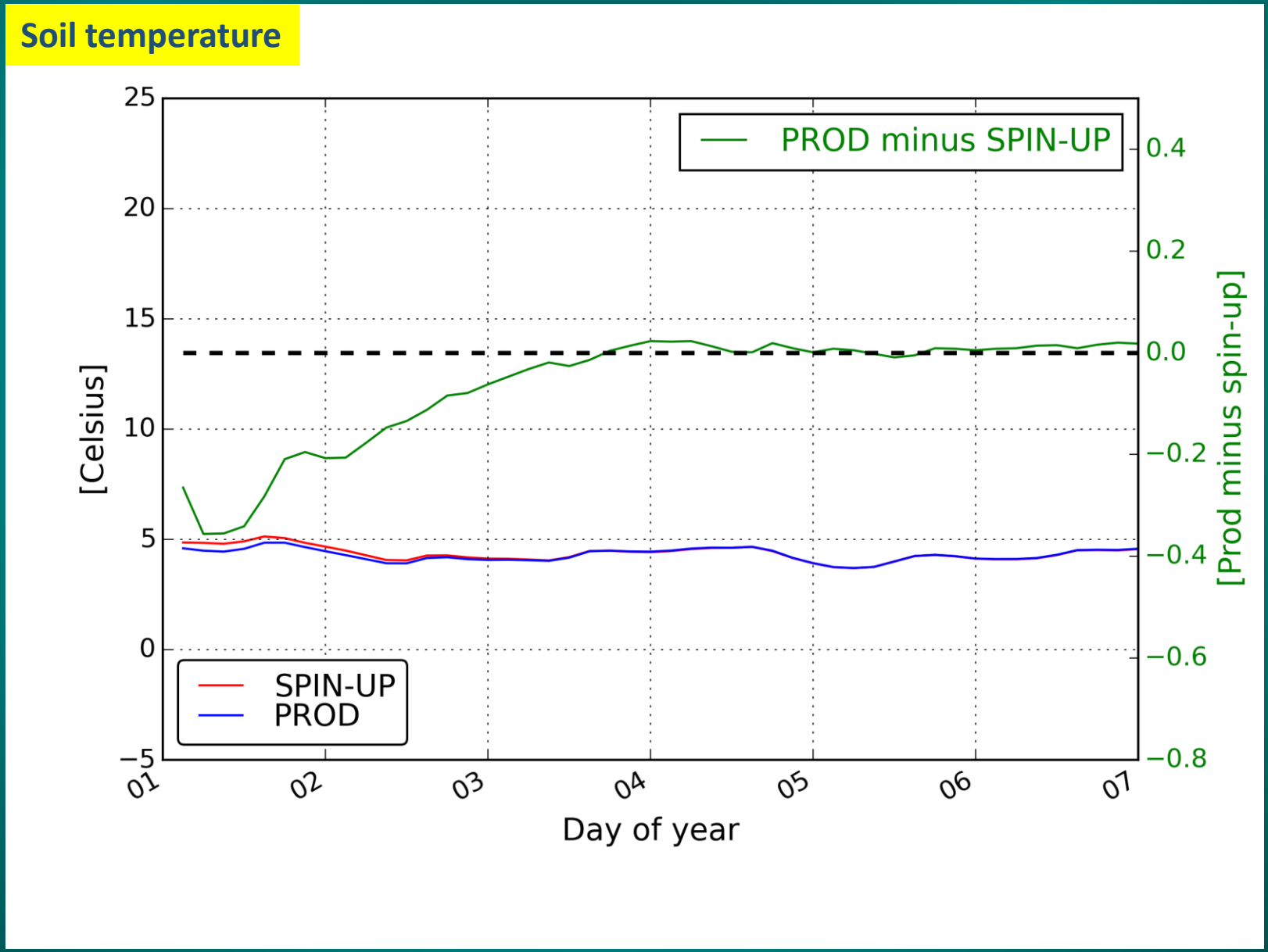
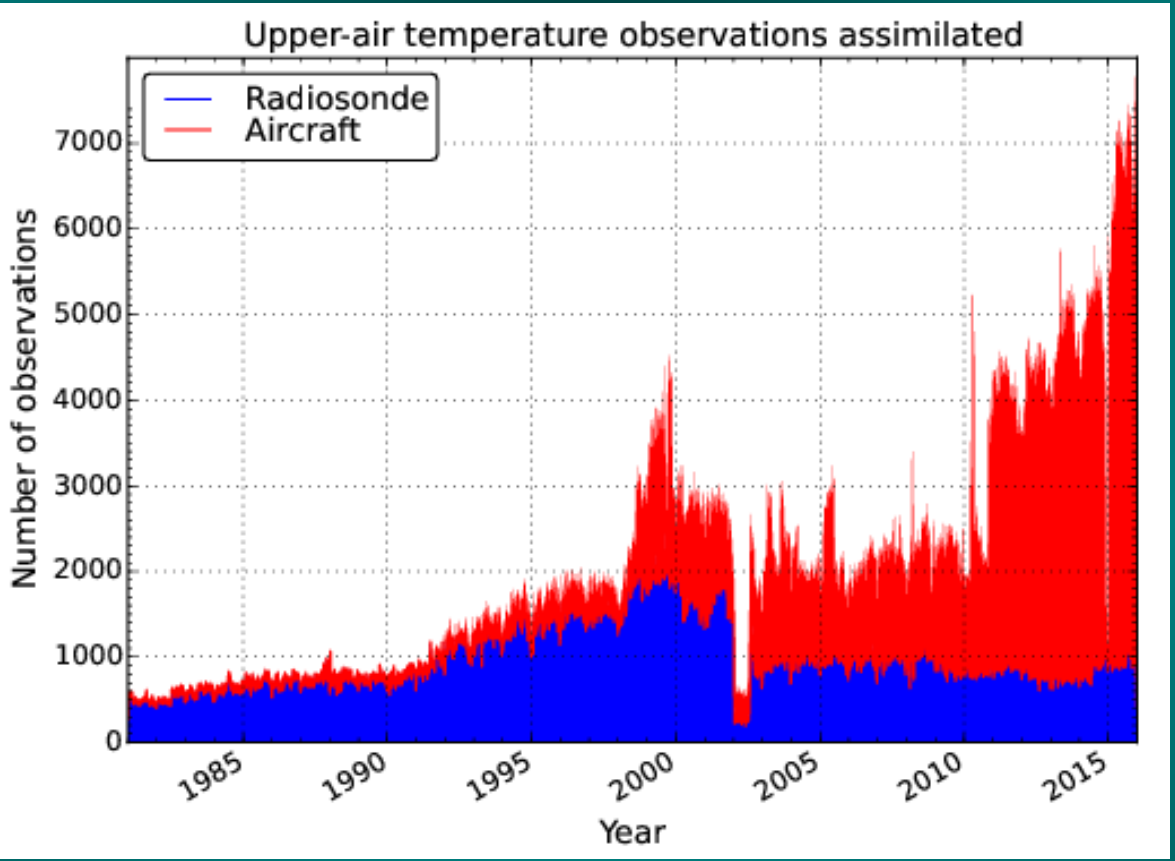


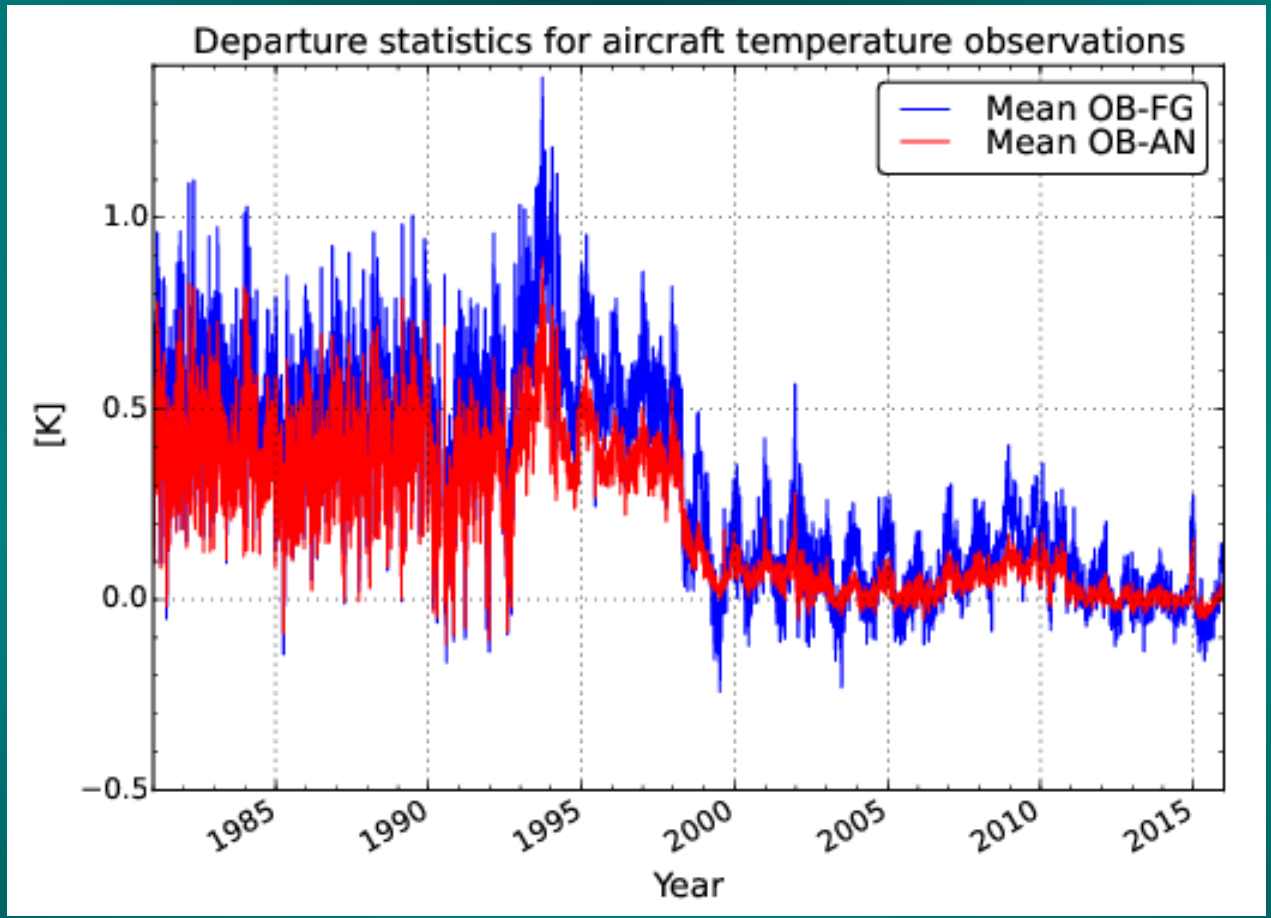
7. Data Assimilation

- Conventional observations assimilated using 3DVar
- 3 hour cycling
- Upper-air temperature observations time-series



7. Data Assimilation

- Aircraft observations
- Analysis (AN) which is closer to the observations (OB) than the model background (FG)



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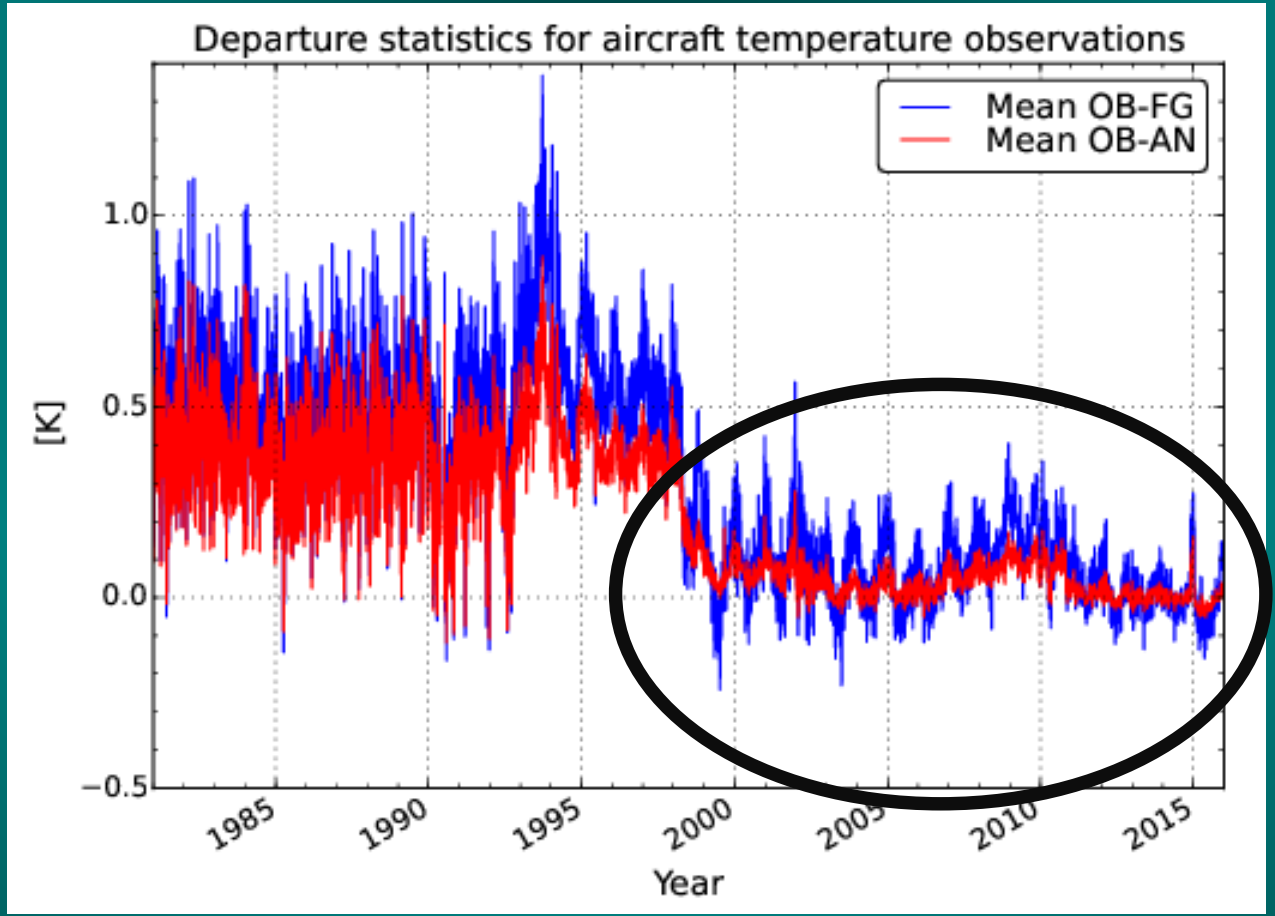
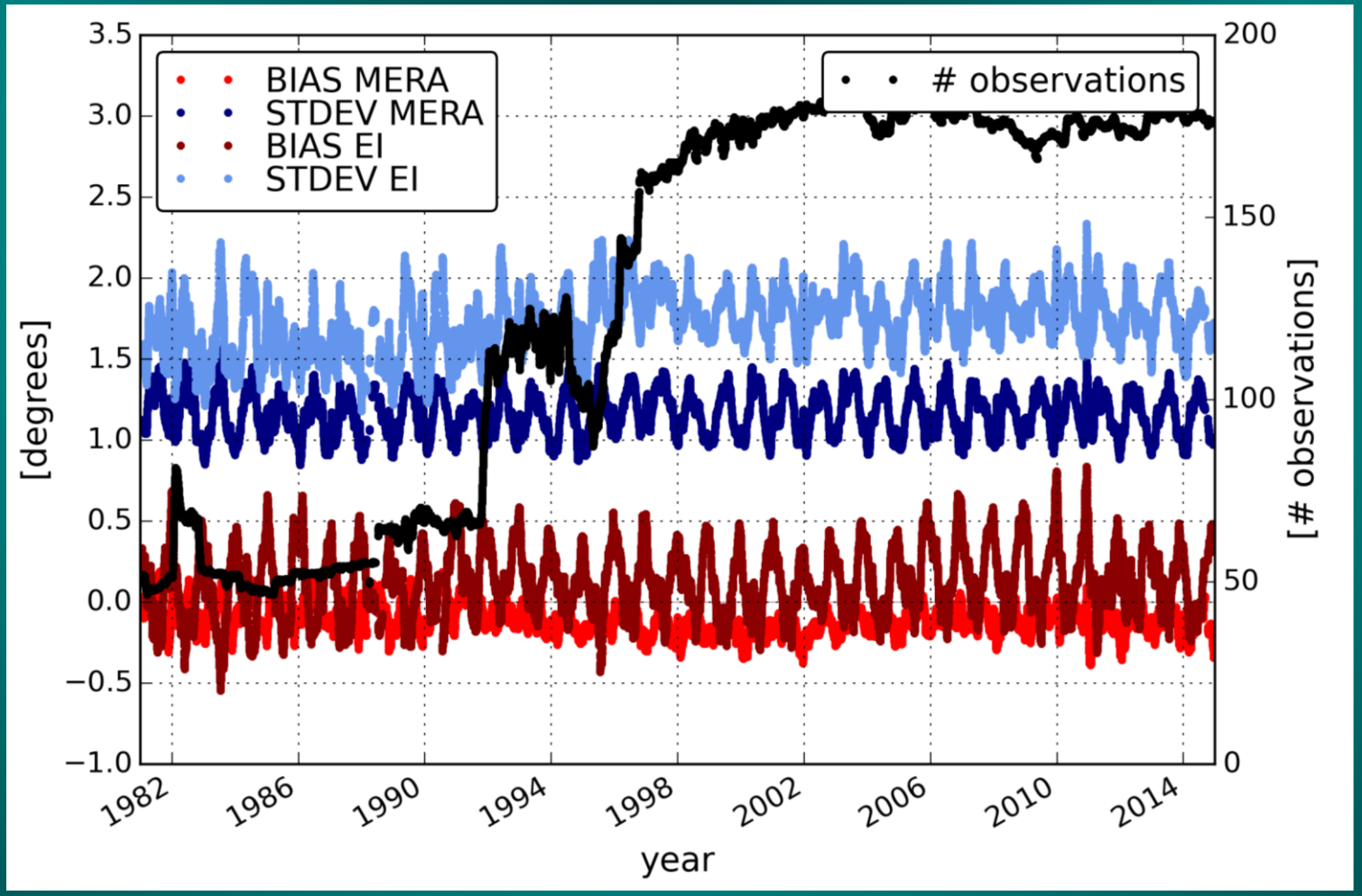
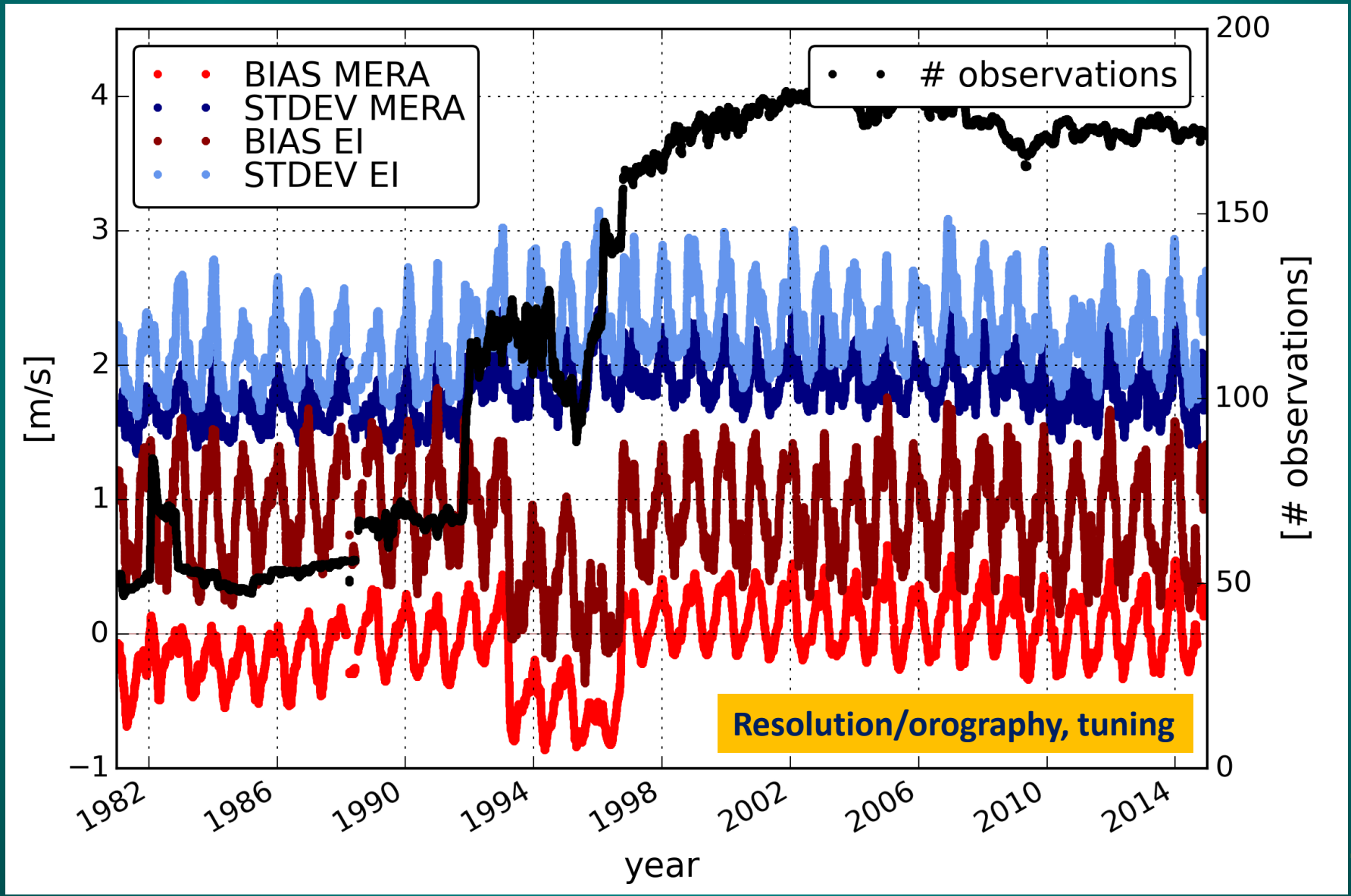


8. Validation 2 m temperatures

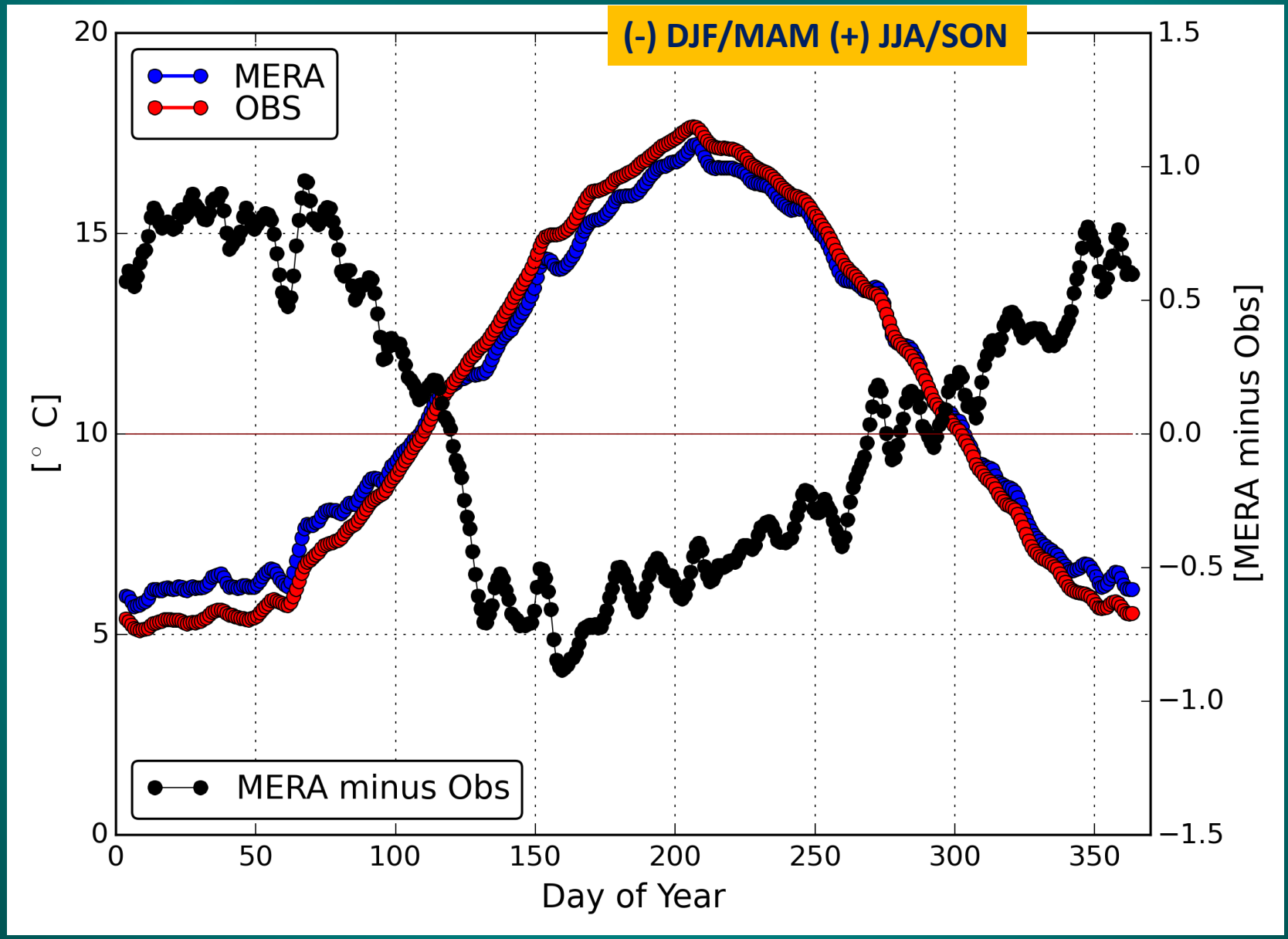
- MÉRA versus ERA-Interim and SYNOP observations
- 3-h forecasts from 00 and 12 Z; 1-month running average



8. Validation 10 m wind speeds



8. Validation soil temperatures



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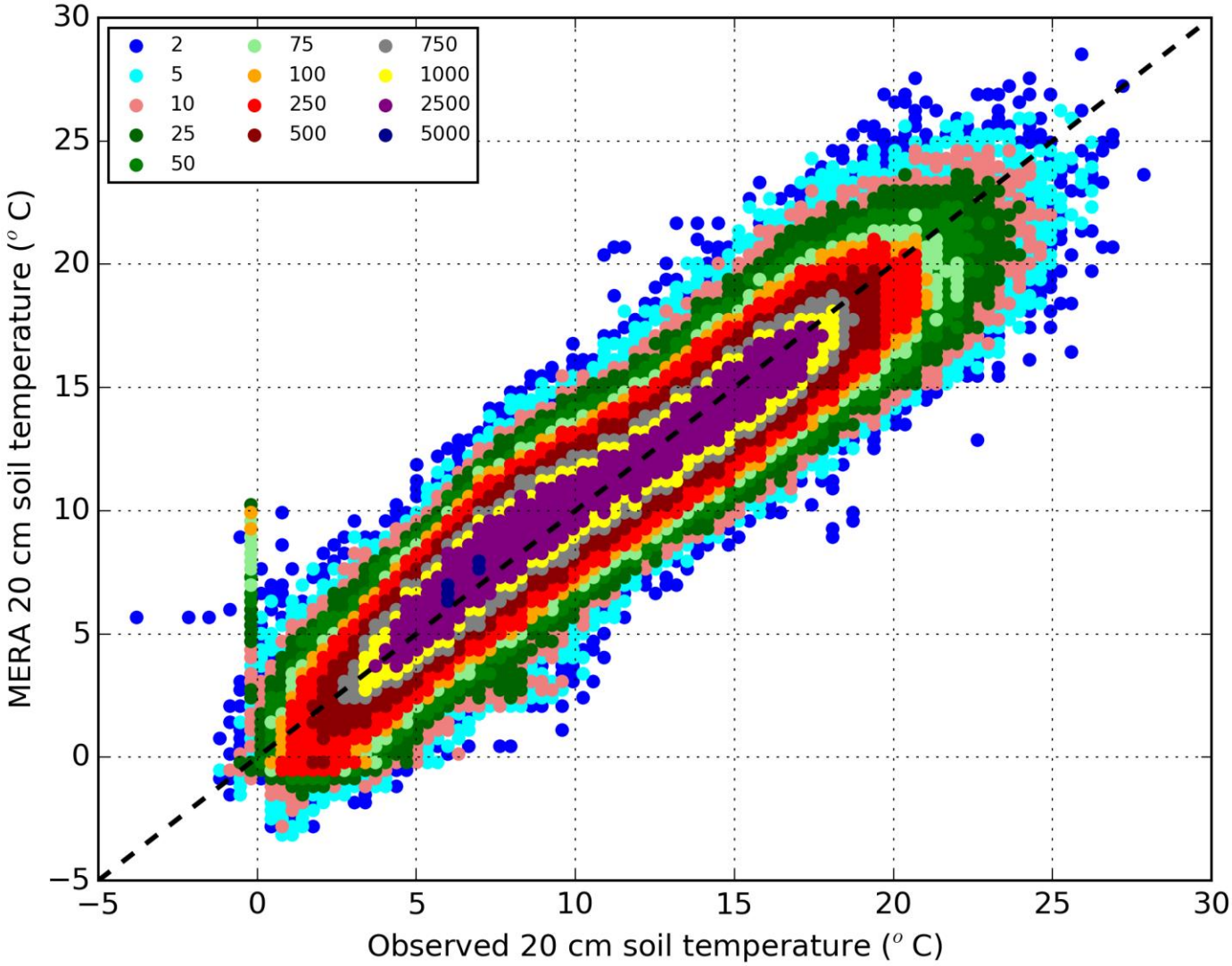
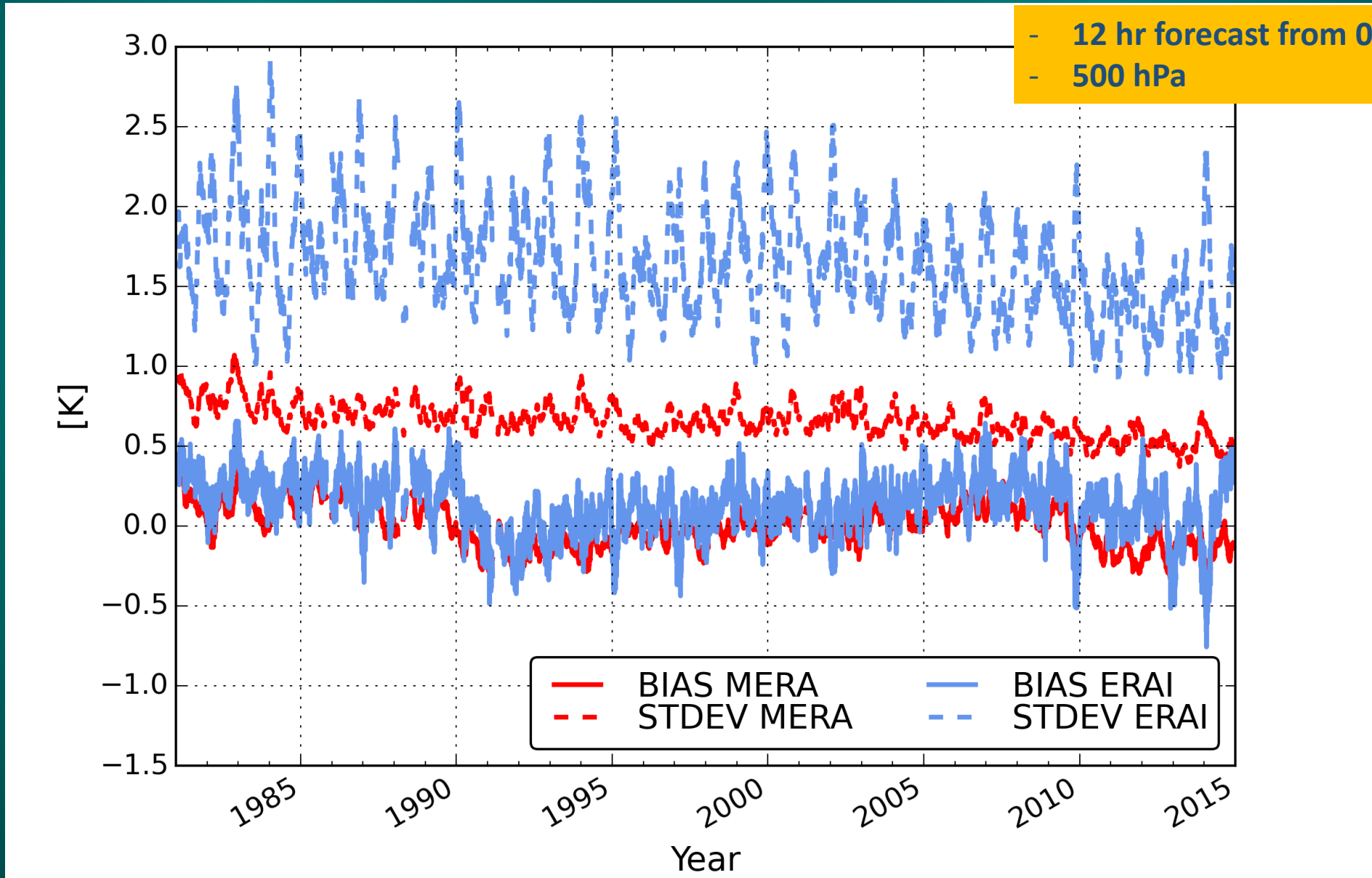
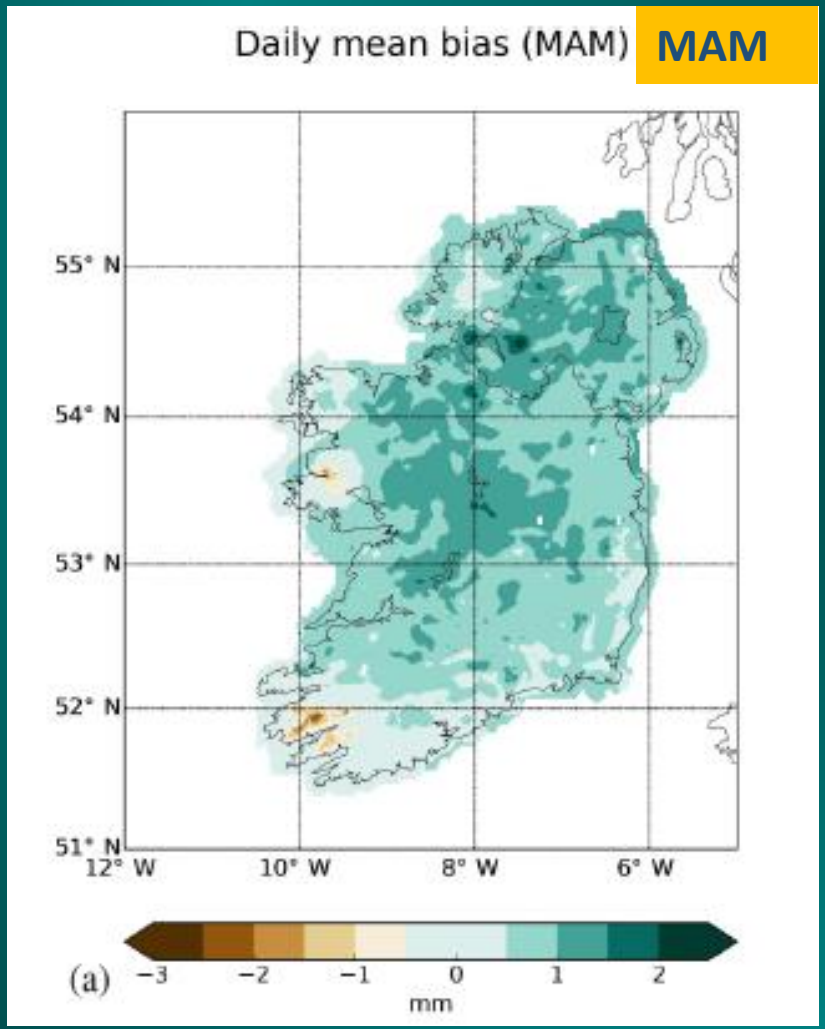


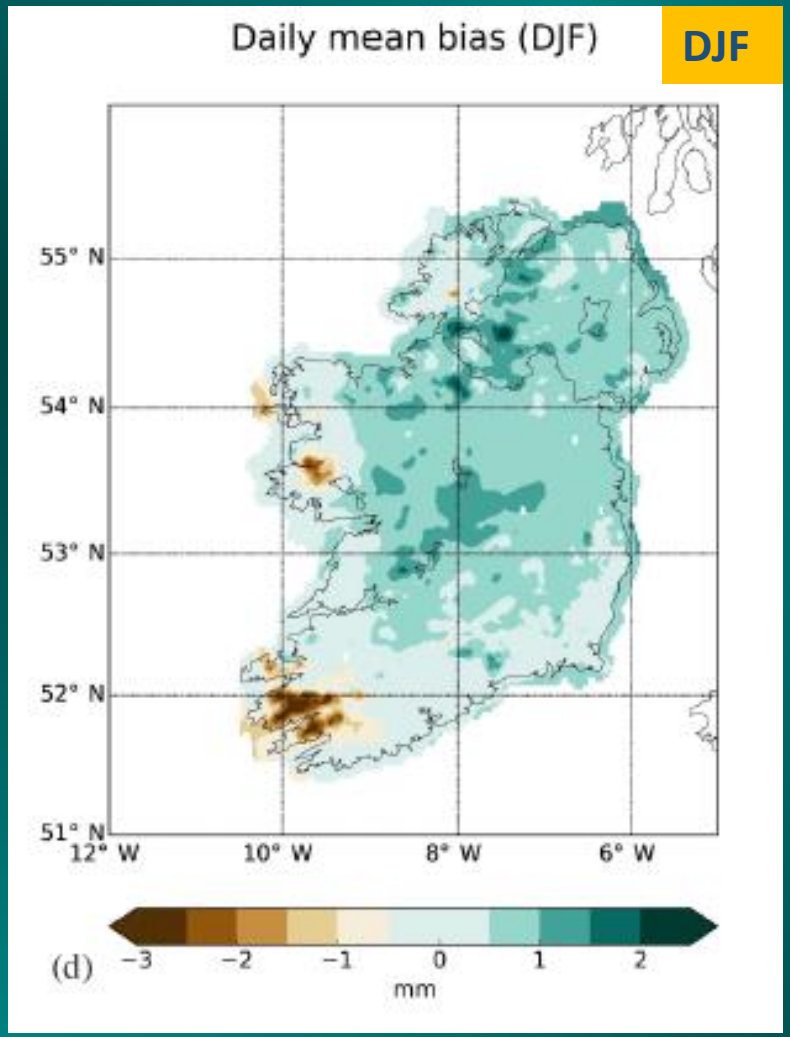
8. Validation upper air



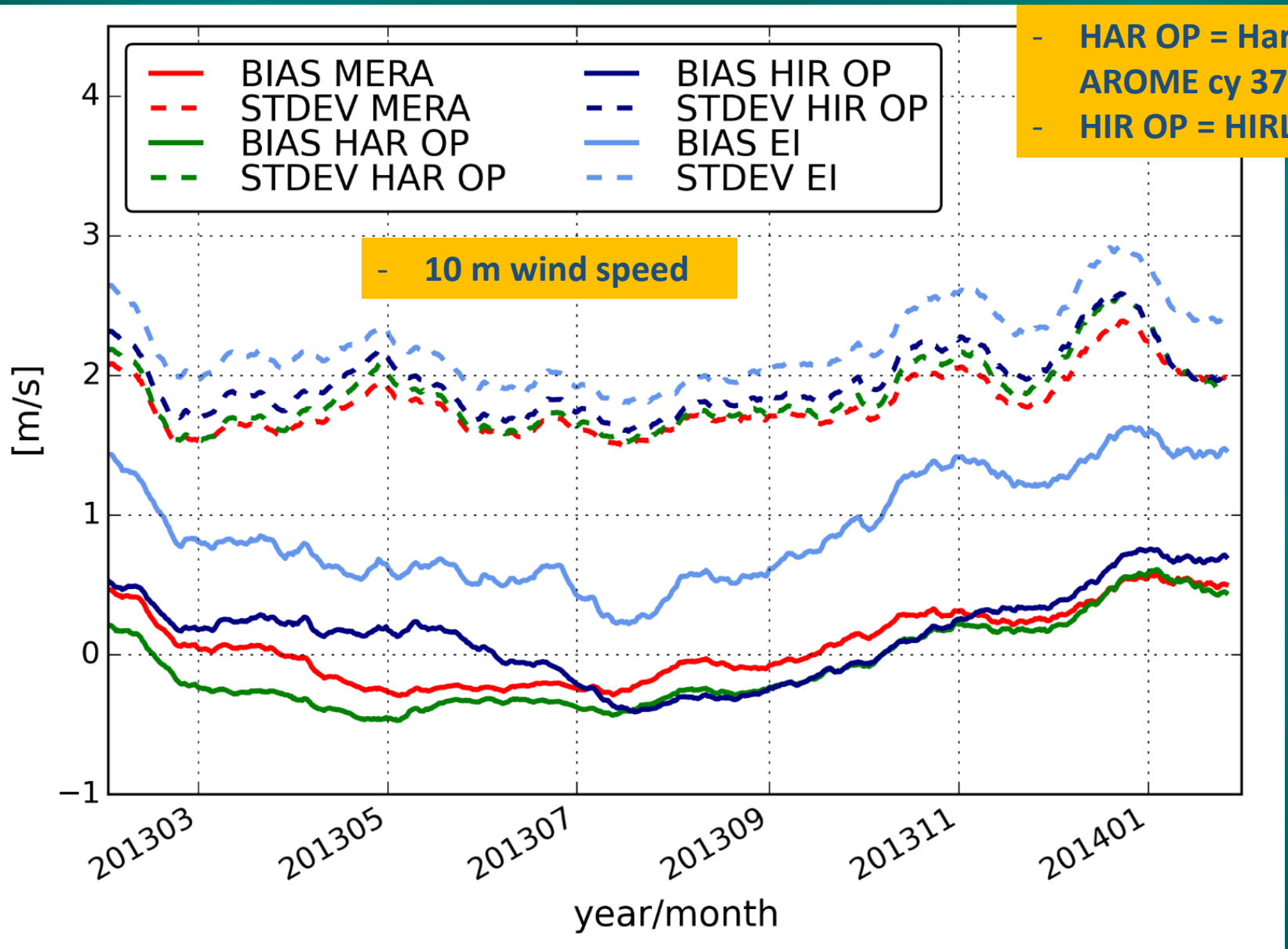
8. Validation precipitation

- Daily biases
- Mainly (+)
- Orographic mismatches





9. Validation vs Operational Models



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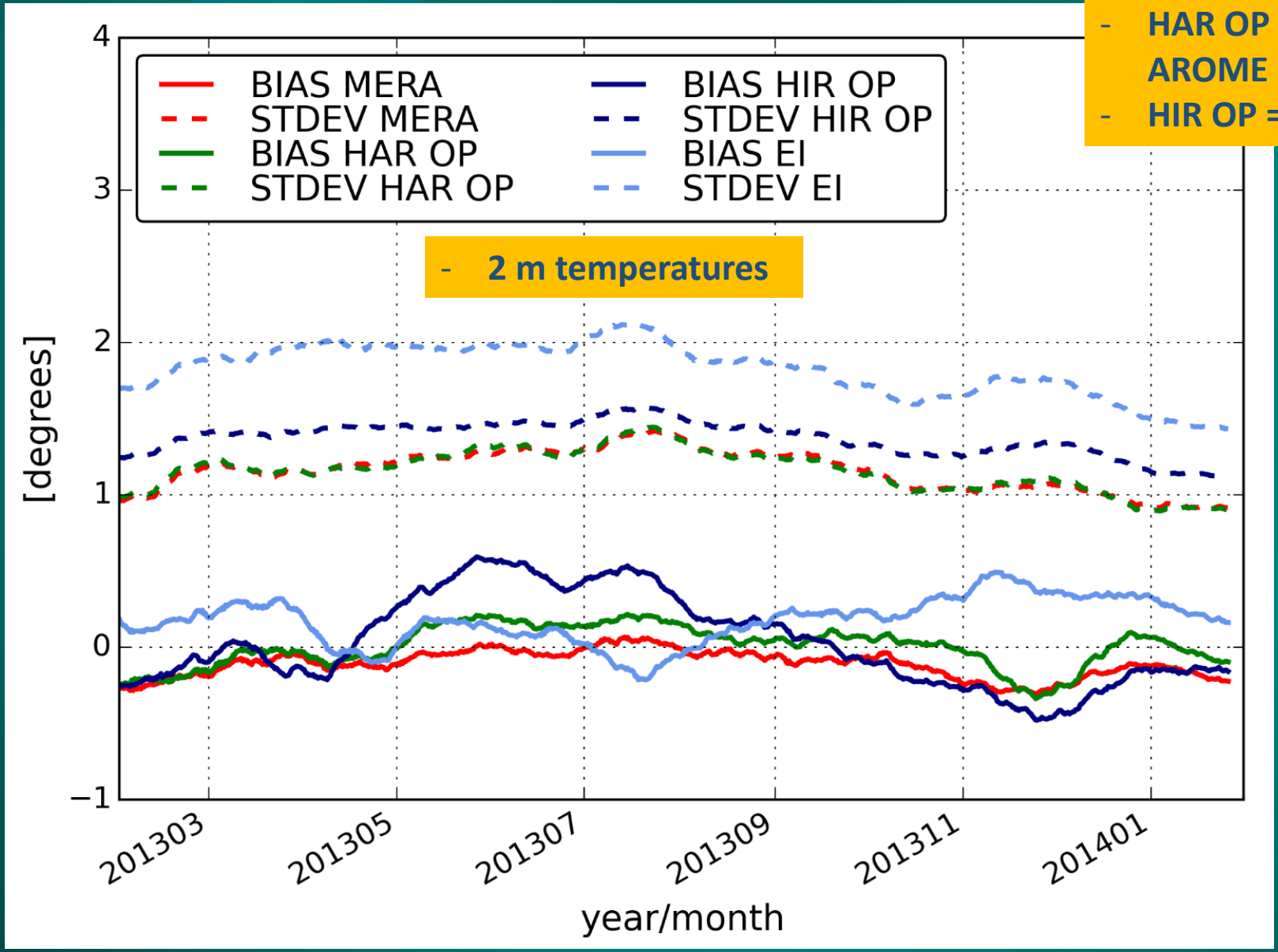

- HAR OP = Harmonie-AROME cy 37h1
- HIR OP = HIRLAM

6. Conclusions and future work

- HARMONIE-AROME data assimilation system and forecast model perform well and consistently
- Shown its advantage over ERA-Interim
- Thorough validation underway
- Dataset will help in the design of our ensemble forecasting system
- Future: larger domain, ensembles, longer time period, better use of observations, coupled atmosphere-ocean system

Adv. Sci. Res., 14, 49-61, 2017
http://www.adv-sci-res.net/14/49/2017/
doi:10.5194/asr-14-49-2017

29 Mar 2017

Met Éireann high resolution reanalysis for Ireland

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Abstract. The Irish Meteorological Service, Met Éireann, has carried out a 35-year very high resolution (2.5 km horizontal grid) regional climate reanalysis for Ireland using the ALADIN-HIRLAM numerical weather prediction system. This article provides an overview of the reanalysis, called MÉRA, as well as a preliminary analysis of surface parameters including screen level temperature, 10 m wind speeds, mean sea-level pressure (MSLP), soil temperatures, soil moisture and 24 h rainfall accumulations. The quality of the 3-D

- Gleeson et al., ASR, 2017
- Paper for submission to QJRMS in prep

Kiitos että kuuntelit!