

Reconstruction of the Greenland ice sheet surface mass balance over 1900-2015 with the help of the regional climate MAR model.

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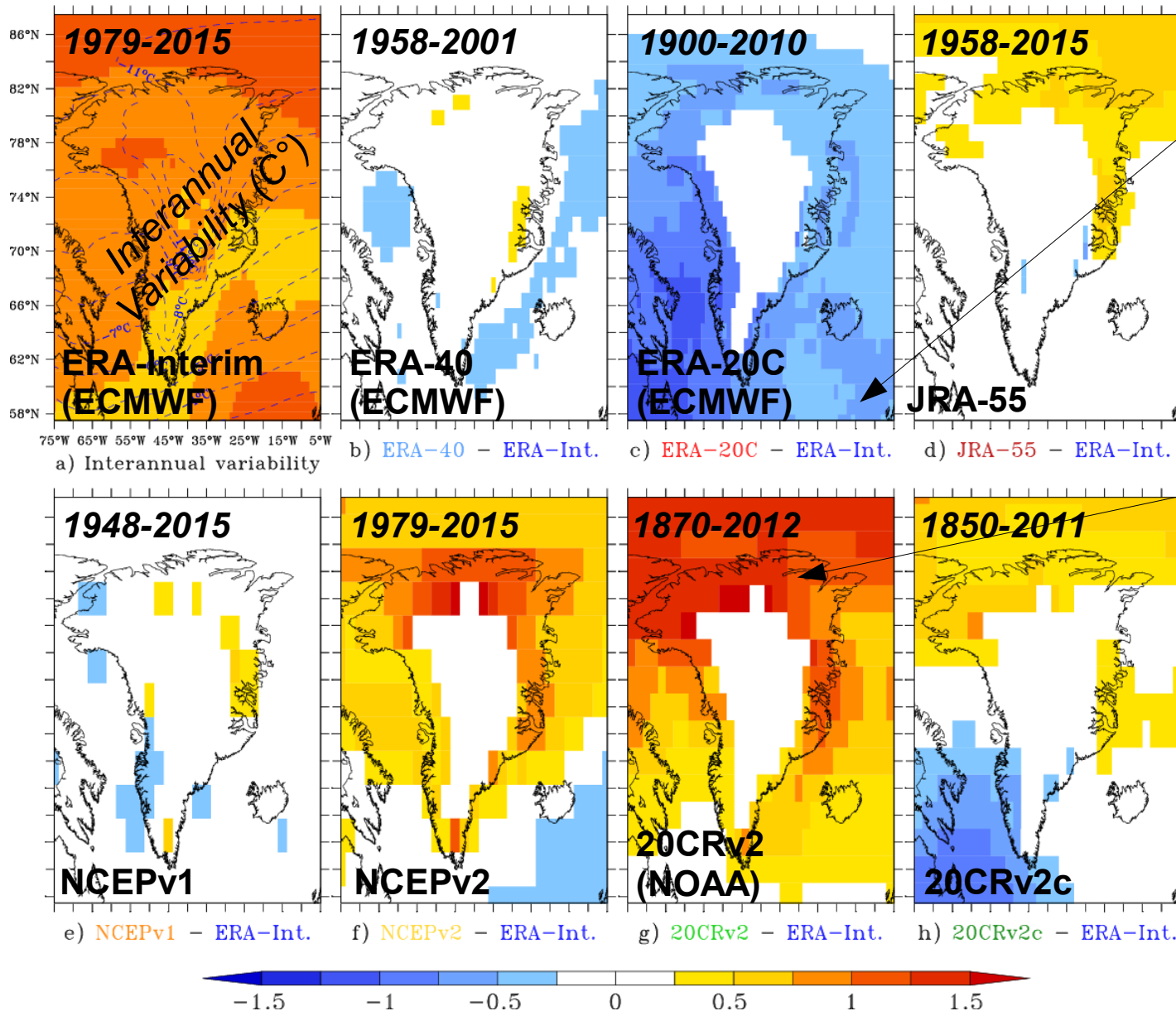
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Vienna, 20.04.2016



1. Reanalysis over present climate

JJA T700 impacts Melt !



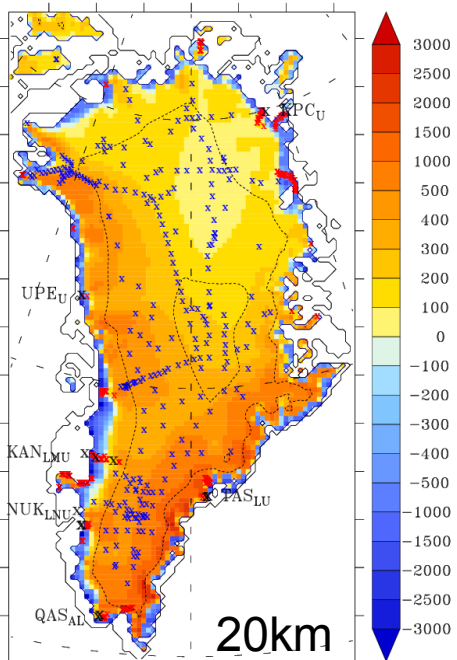
Correction of $+1^\circ$ applied at the MAR boundaries

Correction of -1° applied at the MAR boundaries

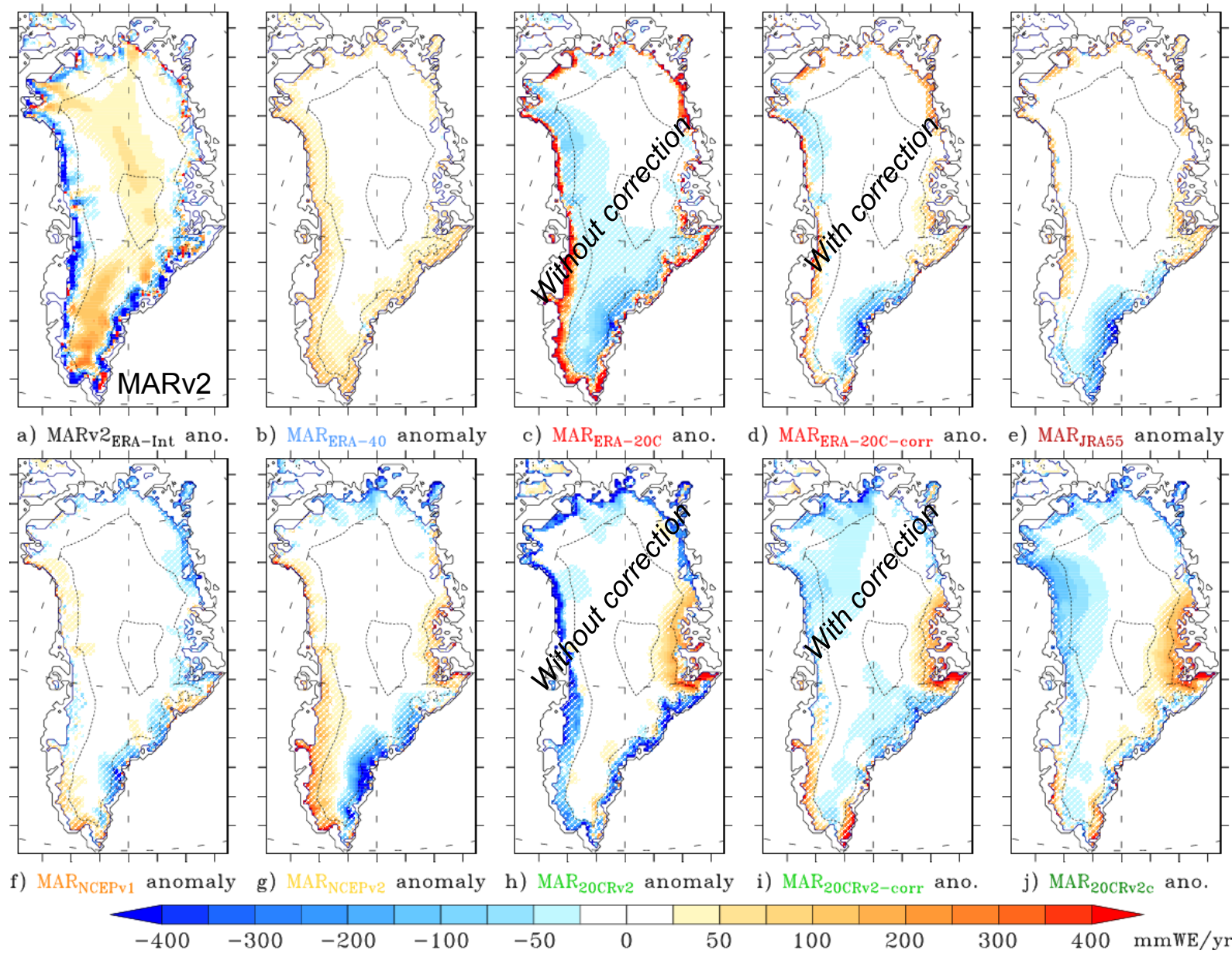
Mean JJA Temperature differences at 700hPa over 1980-1999 in respect to ERA-Interim ($^\circ\text{C}$)

2. MAR over present climate

Differences with the ERA-Interim forced MAR simulation (mmWE/yr)

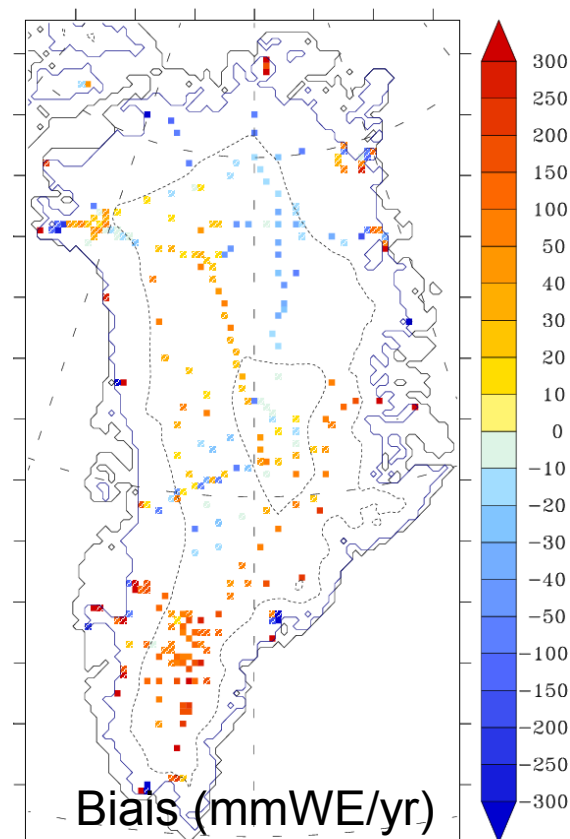
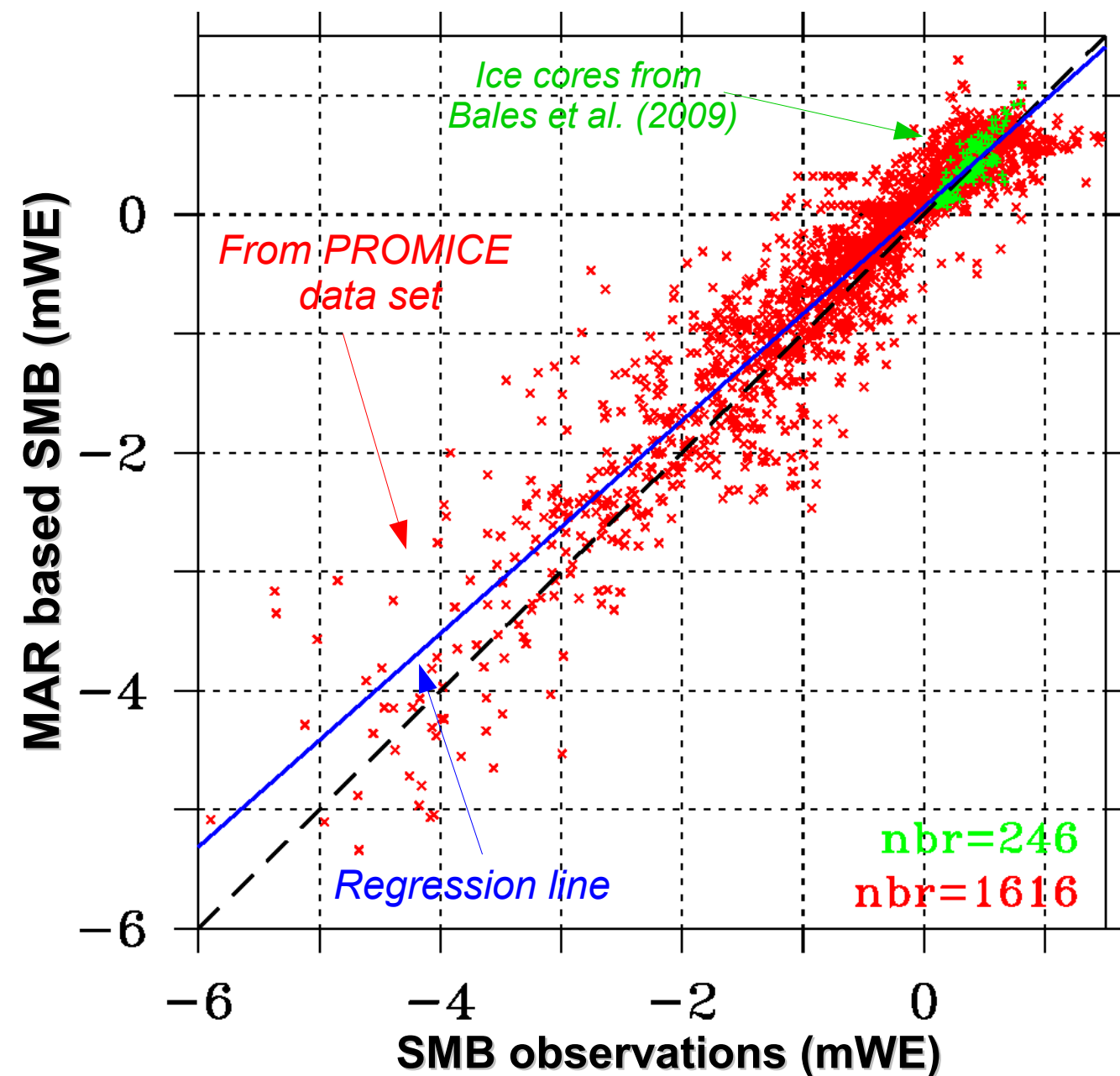


Mean SMB from MAR_{NCEPv1}
Mean SMB (mm/yr)



3. Validation

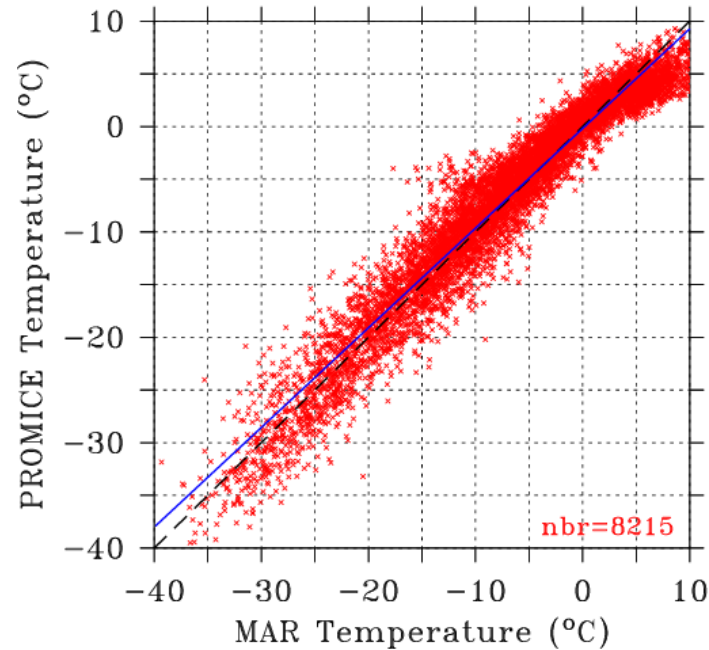
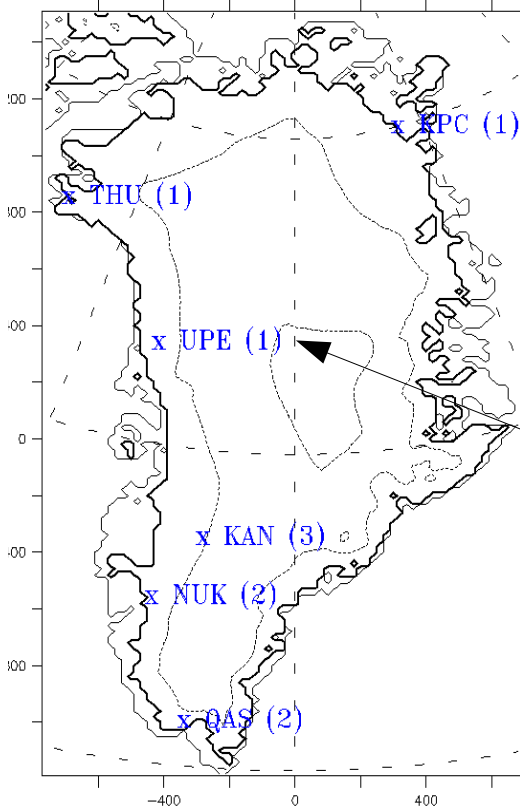
MAR vs 1862 SMB observations over 1958-2010



	Bias	RMSE	Corr.
MAR-ERA	0.14	0.46	0.93
MAR-NCEP1	0.13	0.45	0.93
MAR-20CRv2c	0.14	0.49	0.91
MAR-ERA-20c	0.22	0.52	0.92

3. Validation

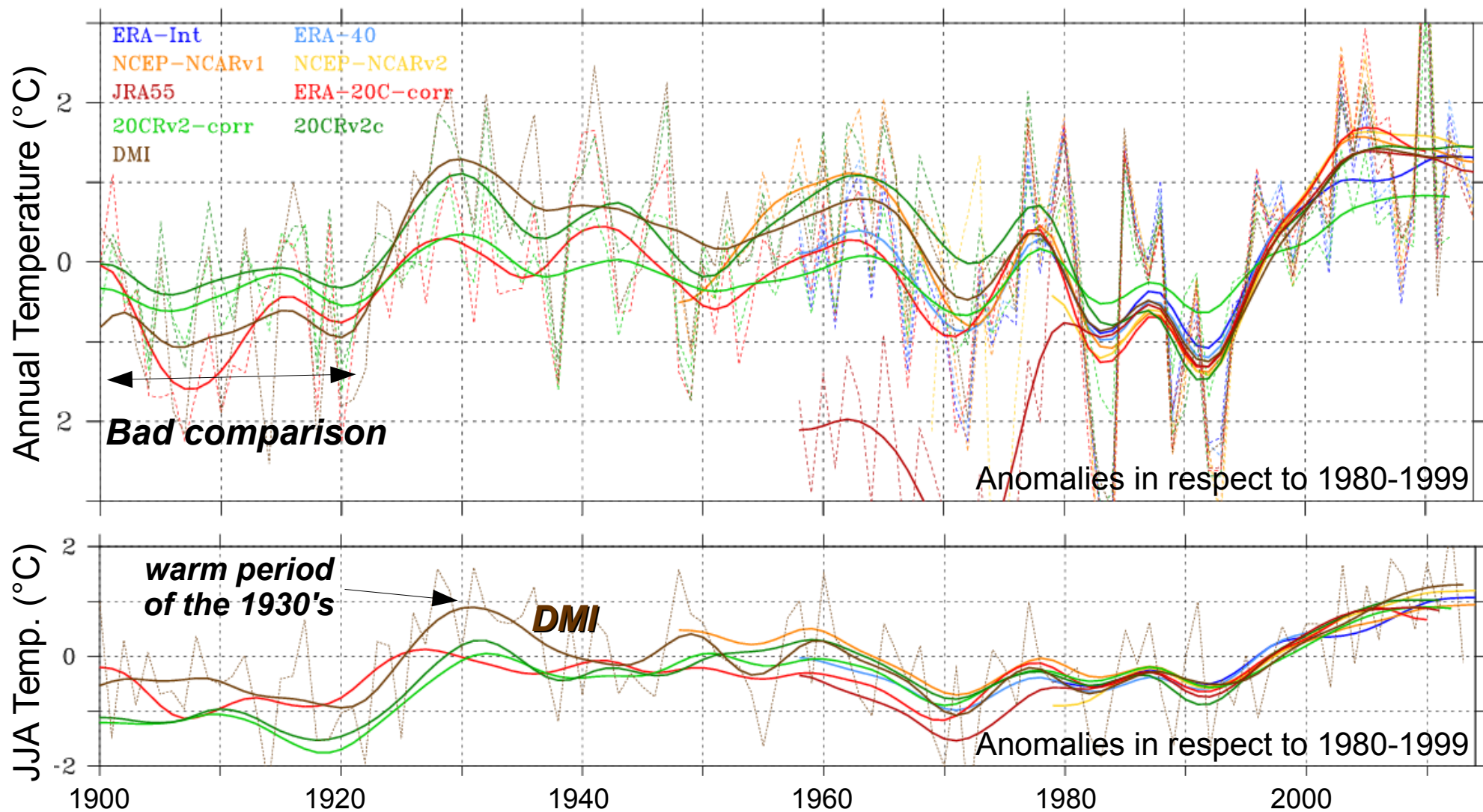
Comparison with 14 AWSs from PROMICE (daily measurements over 2008-2010)



MAR forced by ...

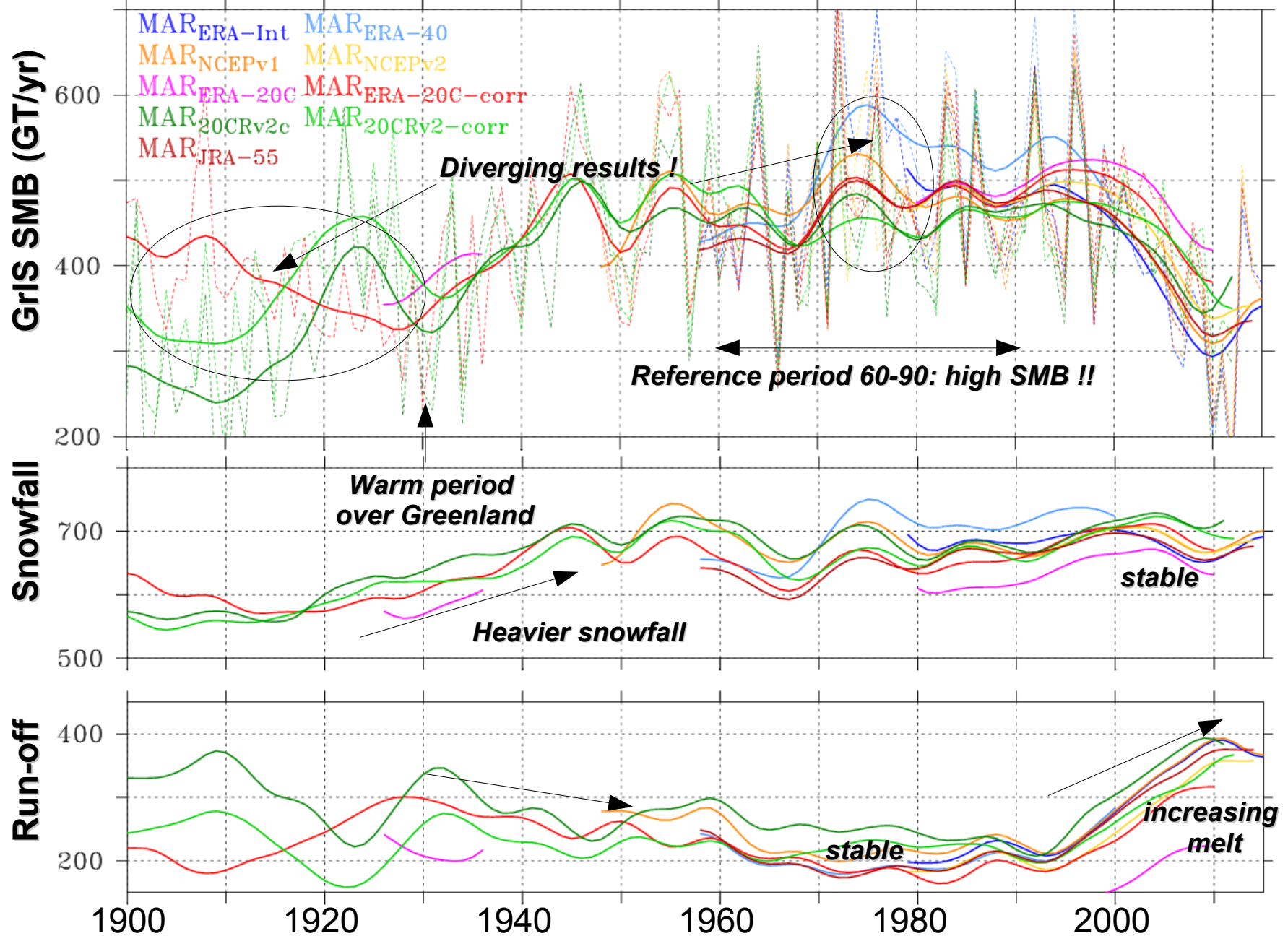
	Surf. pres.	3m-Temperature (°C)				
	Correlation	Correlation	Bias	RMSE	Bias (summer)	rmse (summer)
ERA-Interim	0.99	0.96	-0.29	2.32	-0.65	2.38
NCEP-NCARv1	0.99	0.95	-0.04	2.47	-0.26	2.47
ERA-20C	0.99	0.95	-0.26	2.56	-0.26	2.64
ERA-20C nocorr	0.99	0.95	-1.04	2.76	-1.42	2.94
20CRv2	0.98	0.92	-0.42	3.09	-1.02	3.25
20CRv2c	0.98	0.93	-0.33	3.21	-0.76	3.05

3. Validation



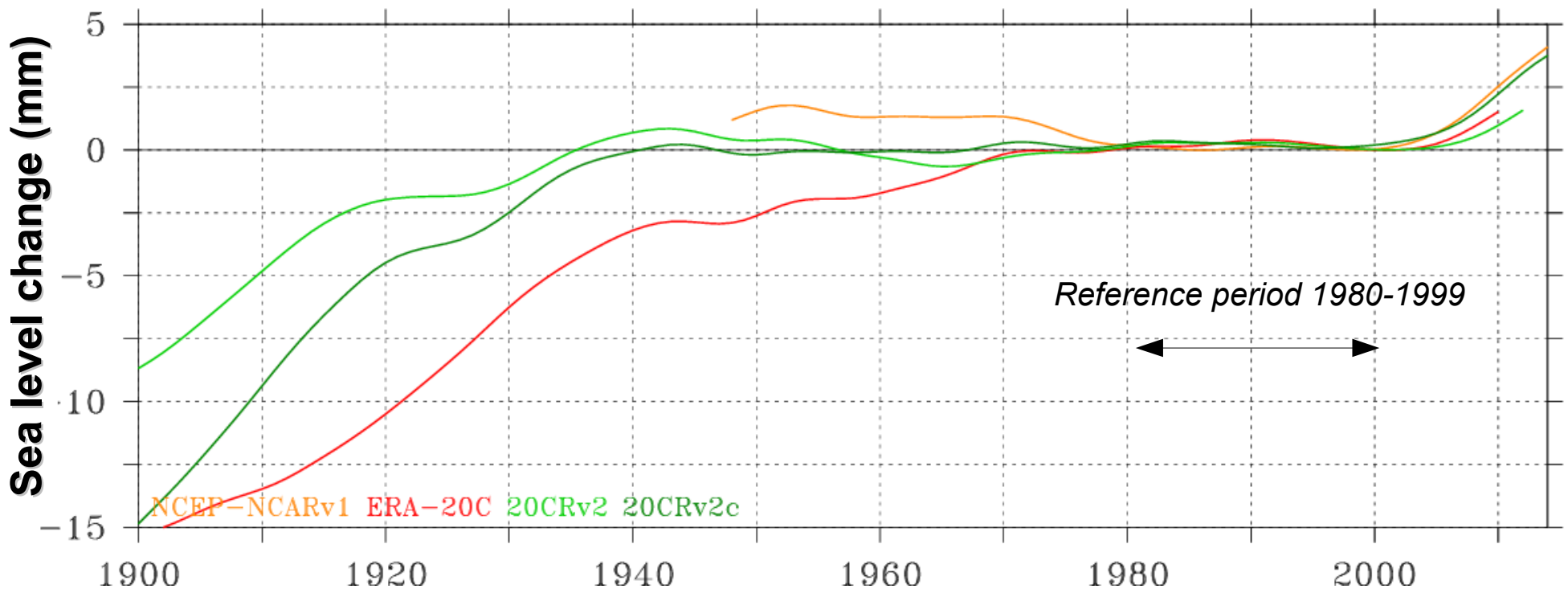
MAR GrIS temperature vs DMI based composite SW Greenland temperature

4. Time evolution



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Impact on sea level from 1900 in respect to 1980-1999



... by assuming no change in ice dynamics ...

Conclusions:

- Good comparison of MAR vs observations + independence of used reanalysis as forcing.
- Coherent results over 1930-2015. Improvements in reanalyses are needed before 1930!
- GrIS SMB changes have contributed to a sea level rise of ~ 15mm.
- 1960-1990 is not a good choice for a reference period.
- Coupling with an ice sheet model to study changes in ice dynamics

Monthly outputs freely available on
<ftp://ftp.climato.be/fettweis/MARv3>

Posters: Wed at 17h30 X4.184
Thu at 17h30 X3.206