

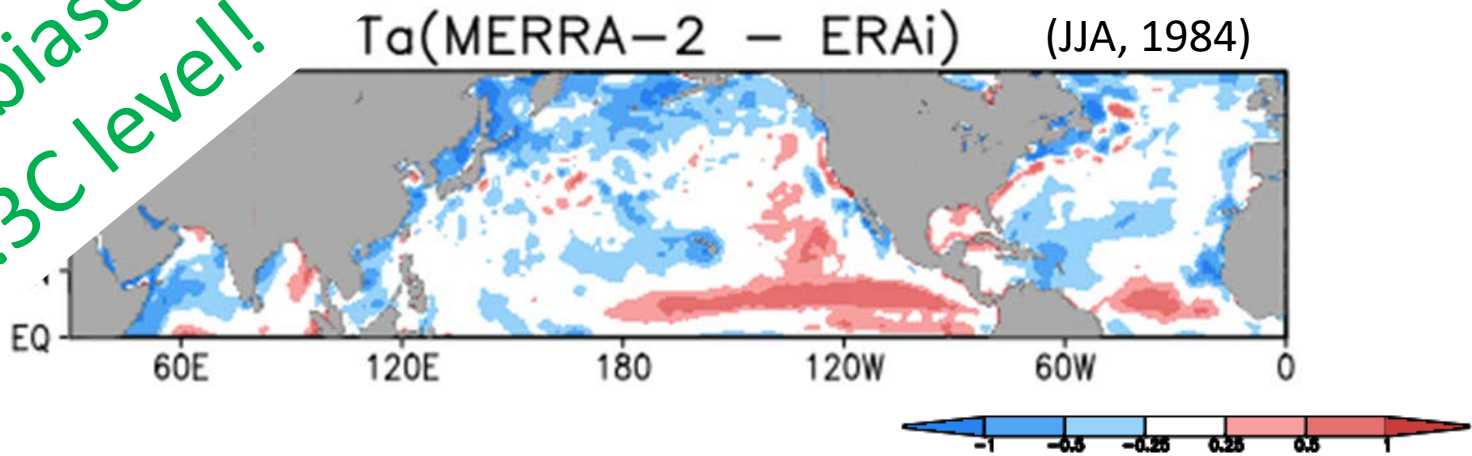
J28.4 Impact of Bias in the Marine Air Temperature Observation Set on Atmospheric Reanalyses

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Joint Session 28: Statistical Estimation Methods for Parameters of Observing and Assimilation Systems: Theory and Practice #365876

T_{2m} is biased at
0.3C level!



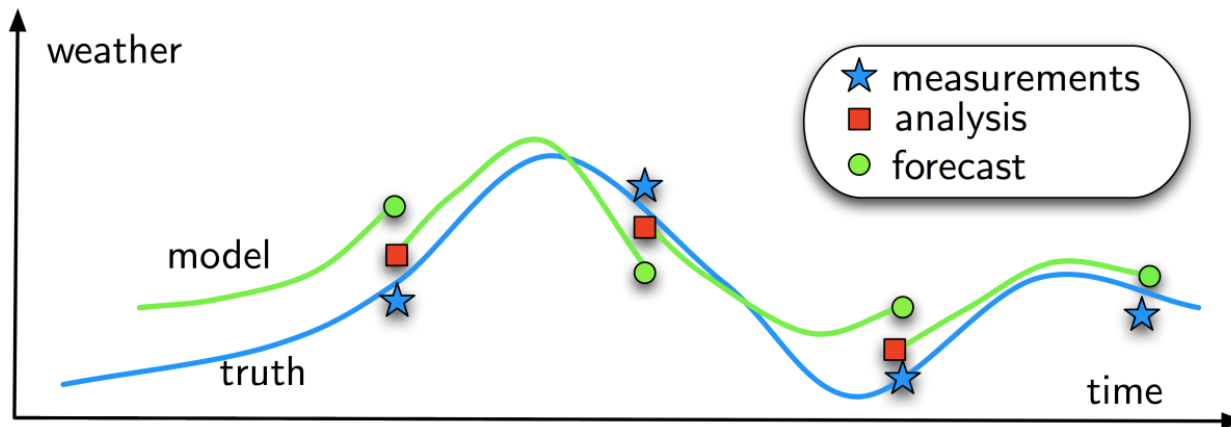
Why we suspect bias in the marine air temperature observation set

Temperature sensor located
above a ship's deck



Dark colored deck
heats up on sunny
afternoons

Reanalysis Temperature Tendency Equation

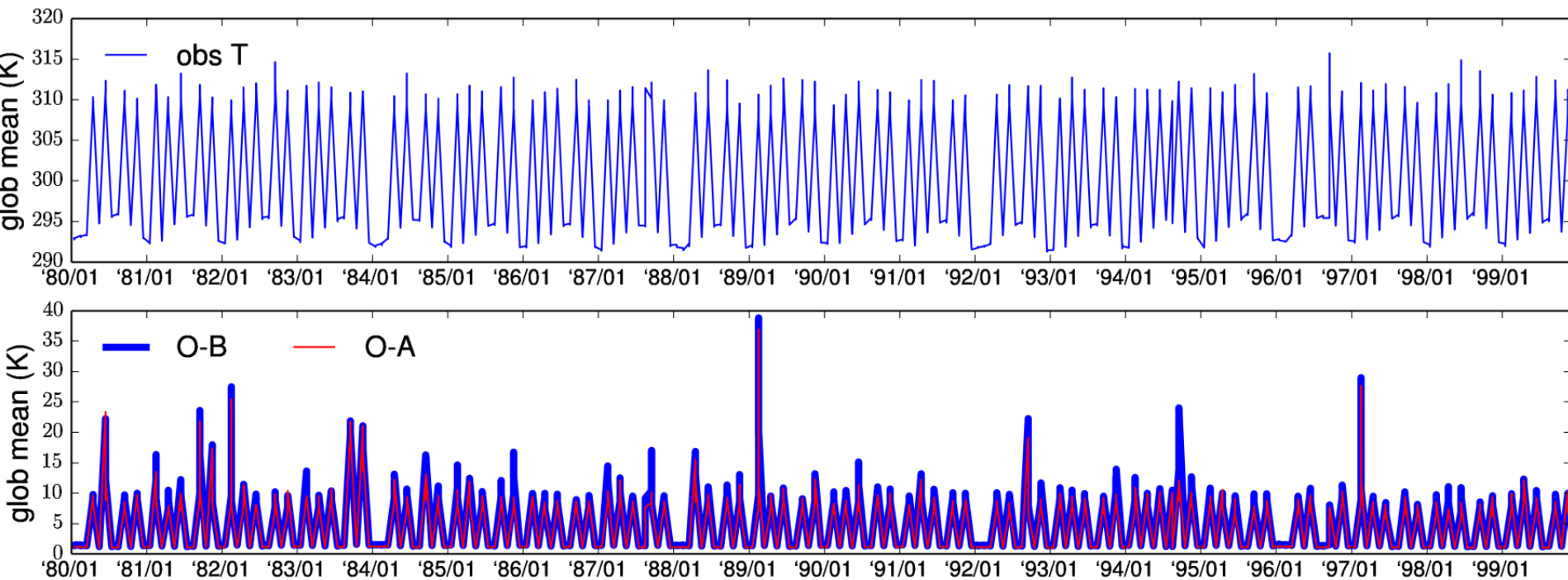


$$\dot{T}_{anal} \equiv \left(\frac{T^o - T^b}{\Delta t} \right)_{anal}$$

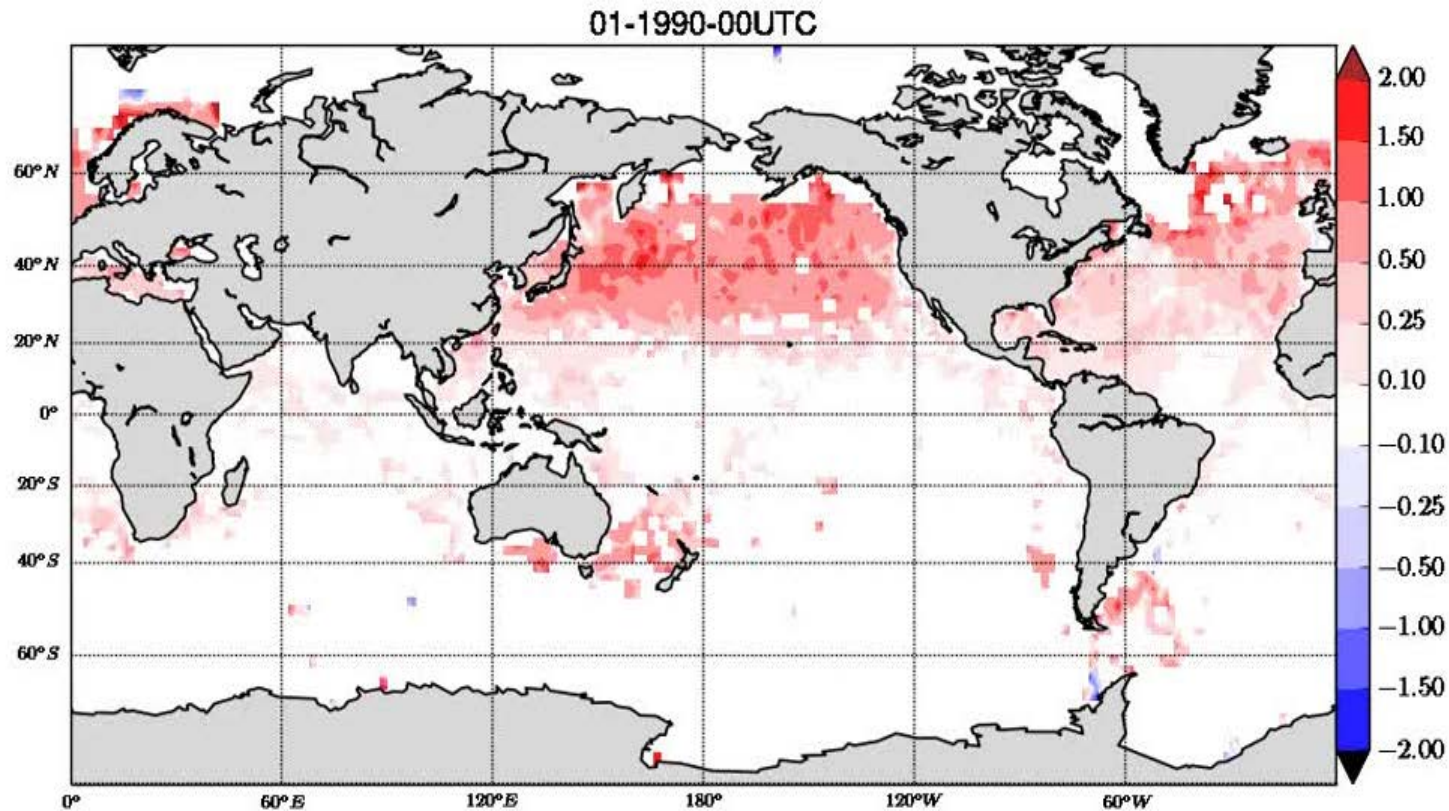
$$\frac{\partial T}{\partial t} = -\vec{U} \cdot \nabla_p T - \omega T \frac{\partial \ln \theta}{\partial t} + \frac{1}{C_p} \frac{DQ_v}{Dt} + \dot{T}_{anal}$$

This talk examines
analysis errors

Global T_{2m} (O-B) and (O-A)



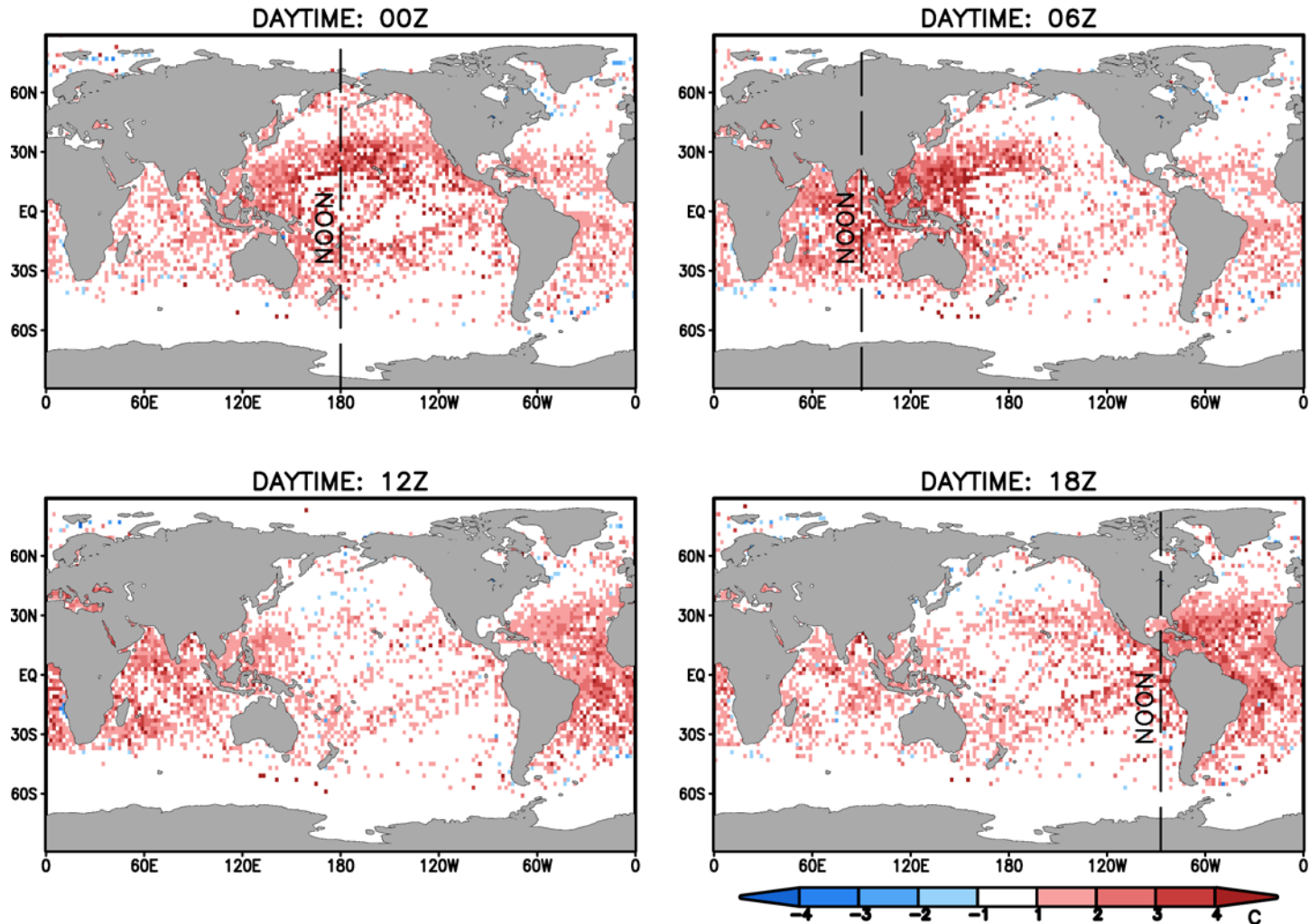
Monthly average of 6hr $T_{2m}(O-A)$



T2m Innovations by day hour

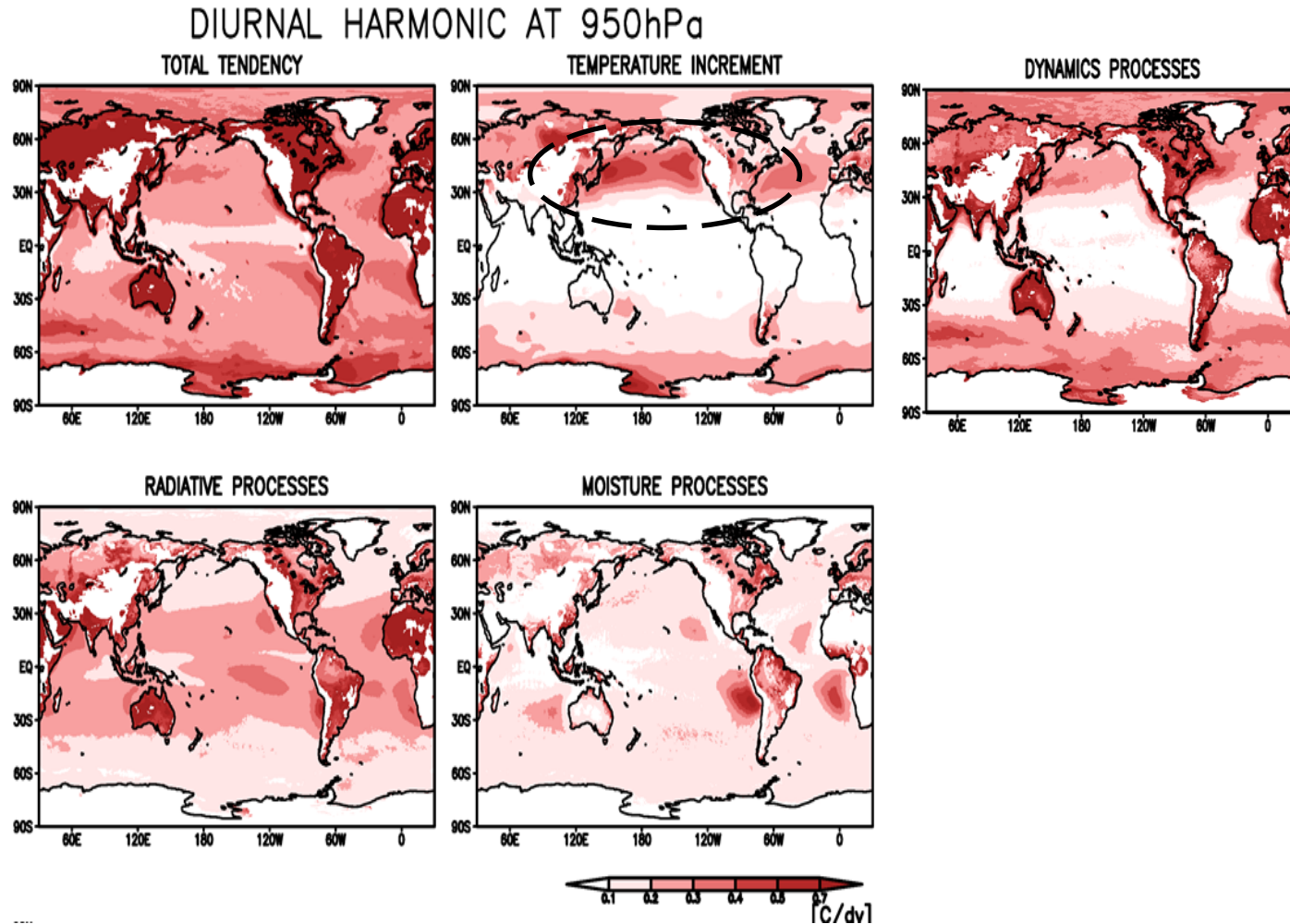
(July, 1983)

T2m INNOVATIONS

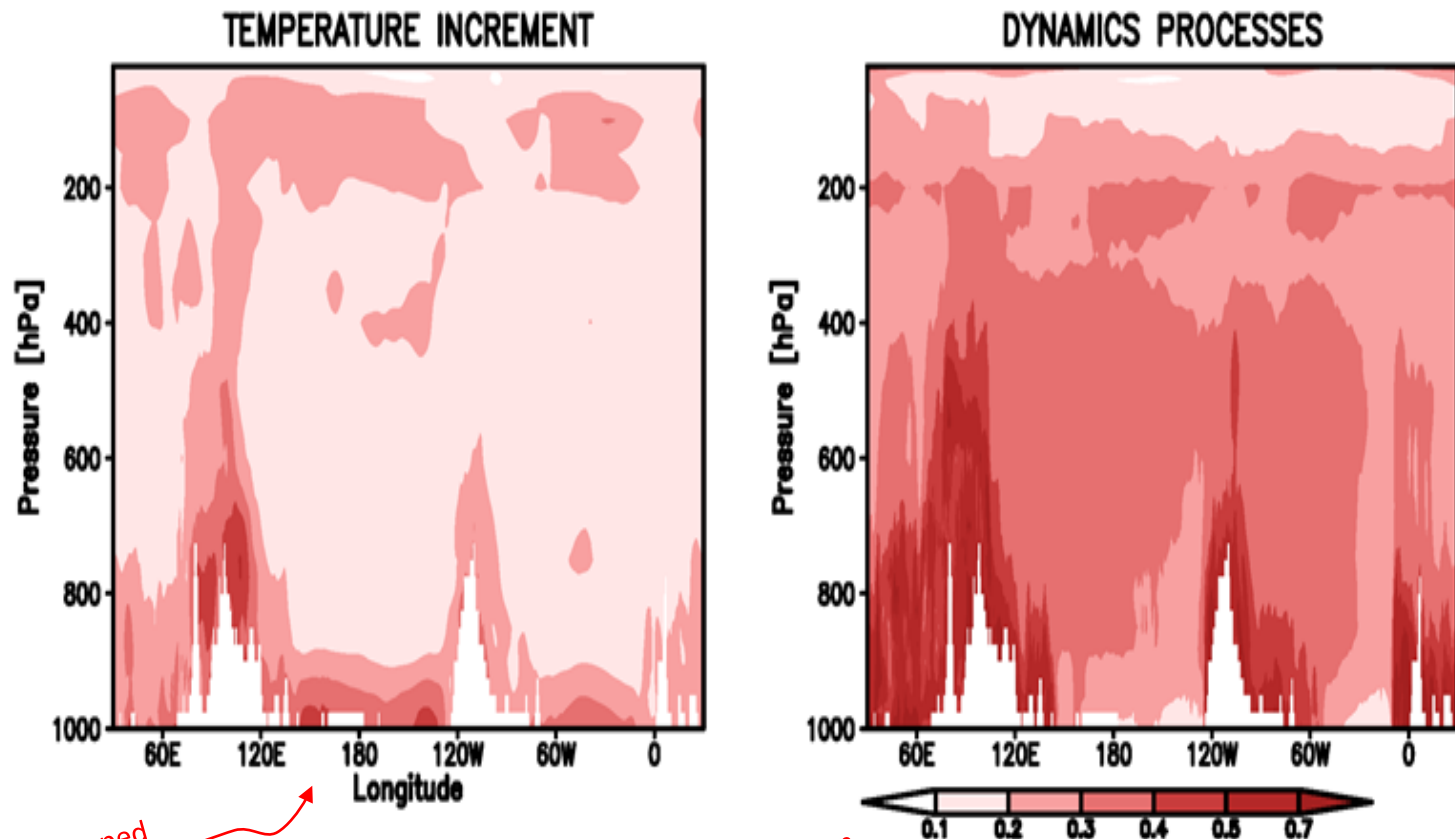


Temperature tendency by component

$$\frac{\partial T}{\partial t} = -\vec{U} \cdot \nabla_p T - \omega T \frac{\partial \ln \theta}{\partial t} + \frac{1}{C_p} \frac{DQ_v}{Dt} + \dot{T}_{anal}$$



Dynamic process v/s Temperature increment along 40°N



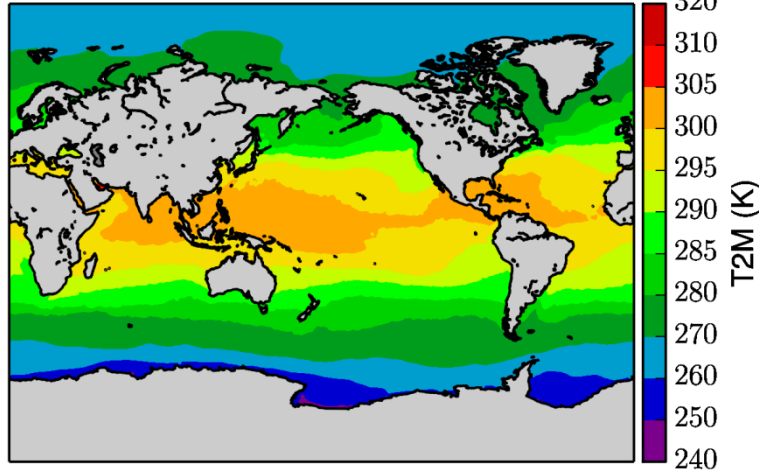
Strongly surface trapped
below 900hPa over both
land and ocean

Dynamics contribution
maximum 800-400hPa
over ocean

Data withholding experiment

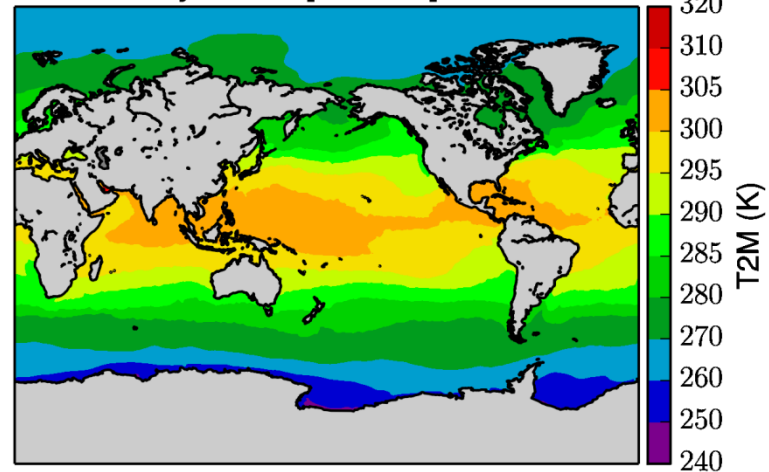
T_{2m} similar to MERRA-2

Monthly Mean [with ship TV] 1982/09

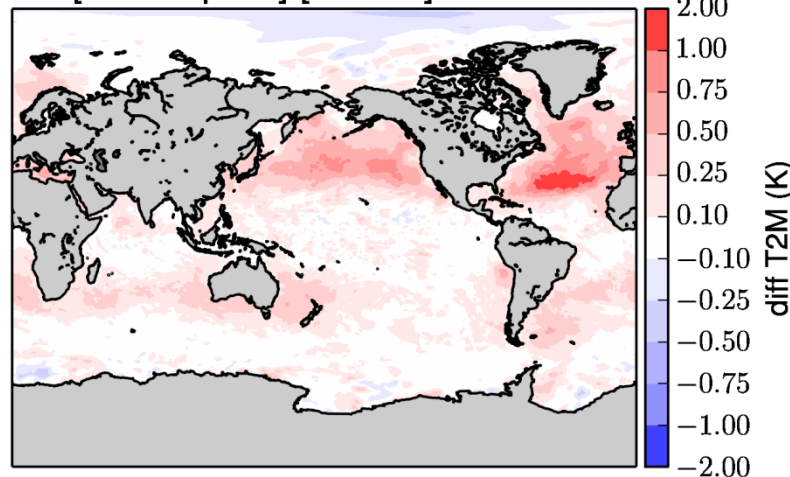


T_{2m} for the data withholding Expt

Monthly Mean [without] 1982/09



[with ship TV]-[without] 1982/09



Impact on T_{2m} →

Conclusions

- A $>0.2^{\circ}\text{C}/\text{dy}$ positive bias in $T_{2\text{m}}$ is evident in latitudes 30°N - 60°N before year 1995.
 - Bias follows the diurnal cycle, maximum at noon
 - Bias declines after year 2000
- Causes: biased $T_{2\text{m}}$ observations and possibly model bias.
- Data withholding experiment: eliminating the $T_{2\text{m}}$ observations reduces analysis $T_{2\text{m}}$ by 0.5 - 1°C in the Northern subtropics.