Forçage du cœur dynamique vers une climatologie réaliste

Marion Saint-Lu • Sébastien Fromang • Gwendal Rivière

- Held & Suarez 1994 parametrization : **relaxation towards a radiative-equilibrium potential temperature**

At each model timestep:

$$\frac{d\theta(\lambda,\phi,p)}{dt} = \frac{\theta(\lambda,\phi,p) - \theta_{eq}(\phi,p)}{\tau(\phi,p)}$$

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$$\frac{d\theta(\lambda,\phi,p)}{dt} = \frac{\theta(\lambda,\phi,p) - \theta_{eq}^{n}(\phi,p)}{\tau(\phi,p)}$$

- Chang 2006 : **Iteration process** to determine θeq and obtain θ close to $\theta target$ *(climato)*.

$$\theta_{eq}(\lambda,\phi,p), \theta_{target}(\lambda,\phi,p) :$$

At first run:

$$\theta_{eq}^{0} = \theta_{target}$$

At each new iteration / new run:

$$\theta_{eq}^{n+1} = \theta_{eq}^{n} - \frac{2}{3}(\bar{\theta} - \theta_{target})$$

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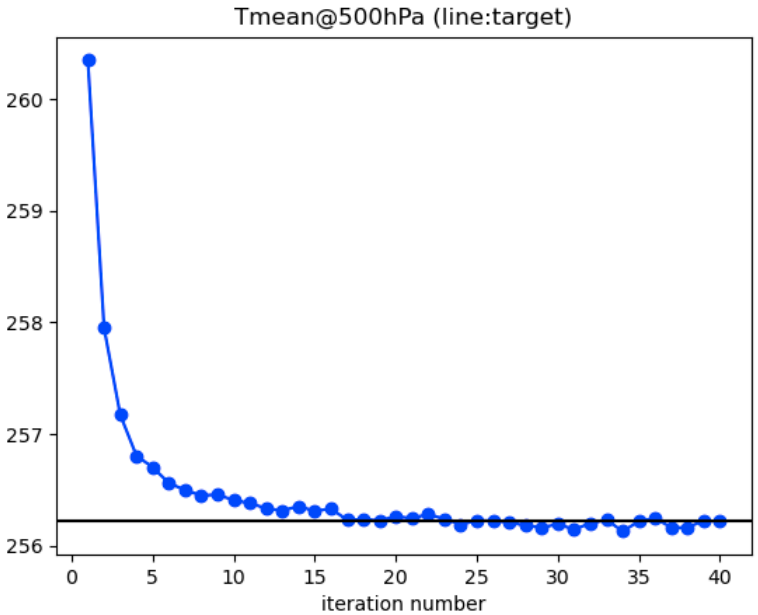
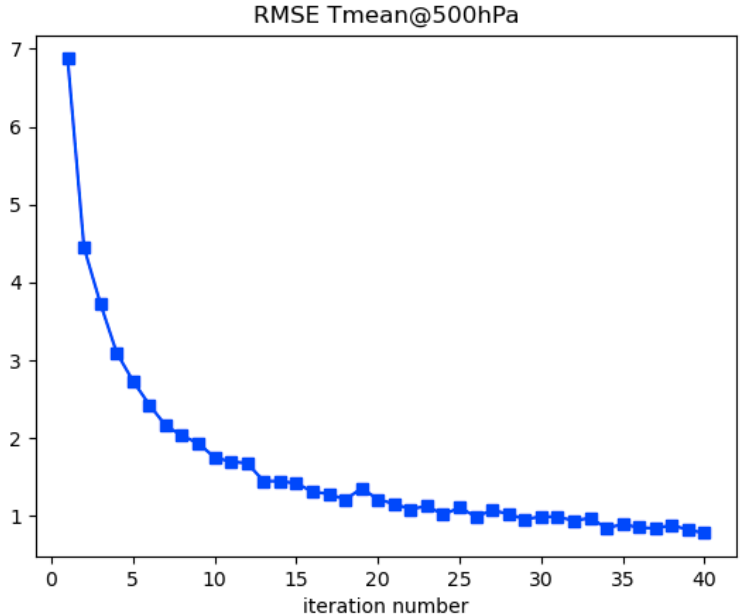
- One 2-year iteration / run on 19 vertical levels = 7-8 minutes (161 processors)

$Ttarget = Teq^0$: ERA5 reanalysis, DJF climatology 1979-2020





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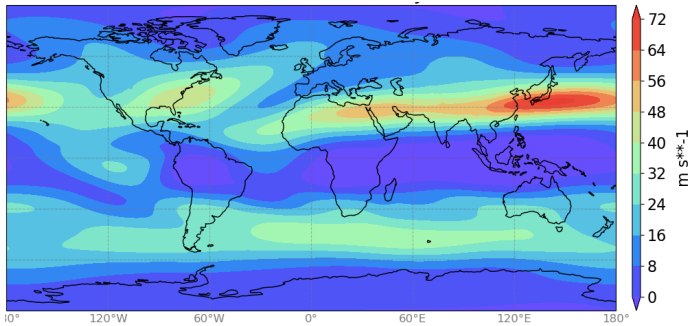
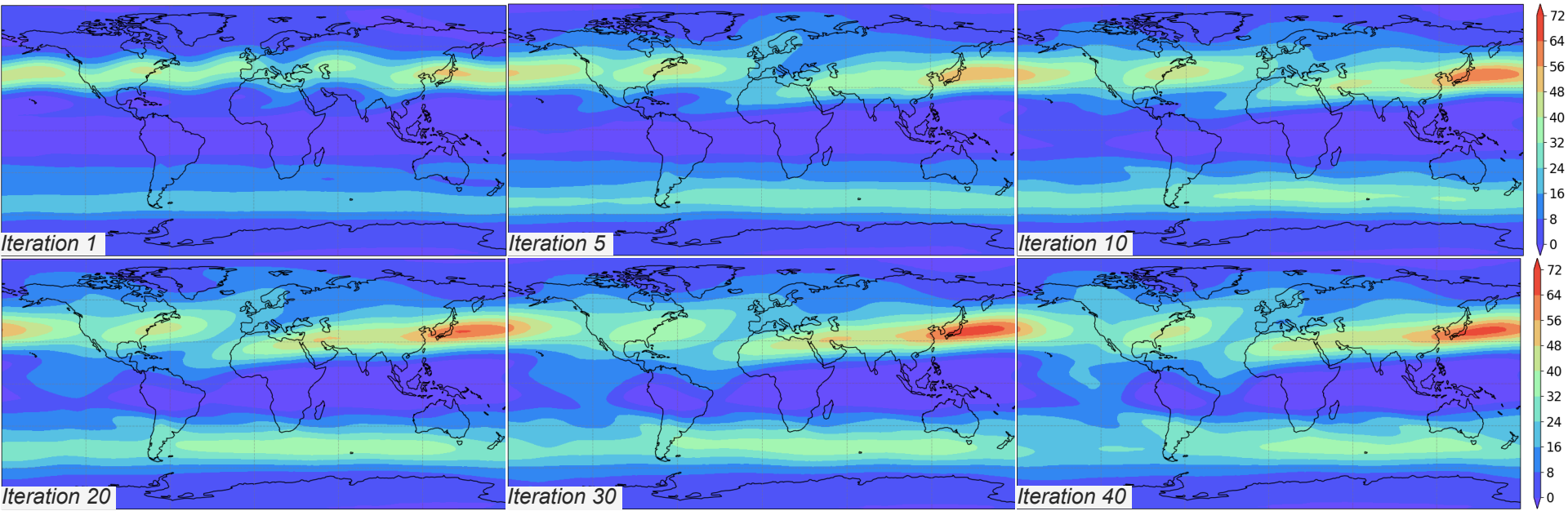
U at 200 hPa target climatology: ERA5 reanalysis, DJF mean 1979-2020



U at 200 hPa dynamico :2 years mean



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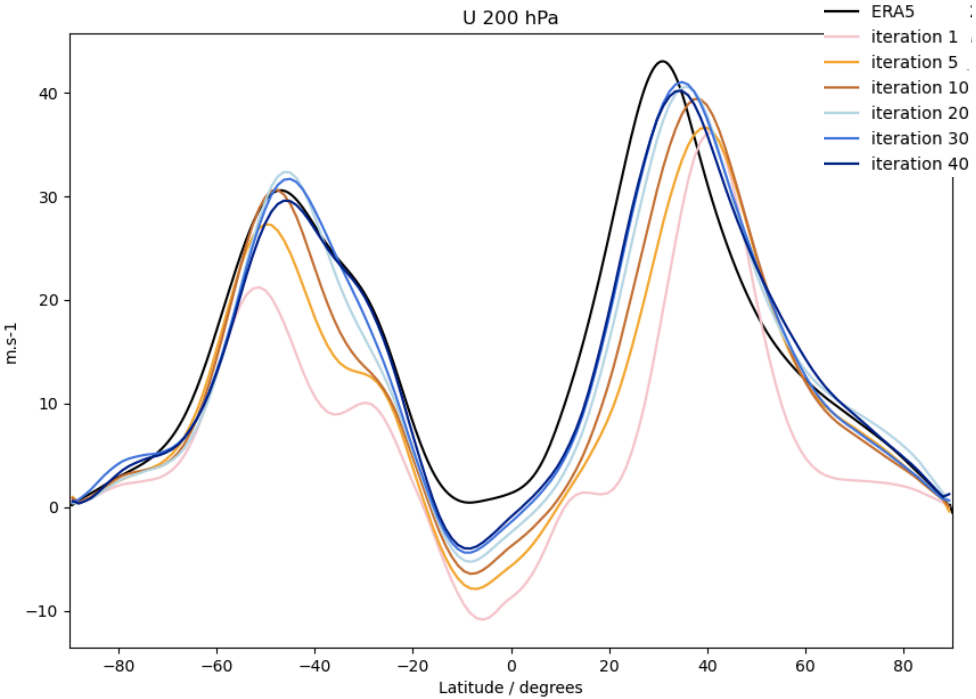
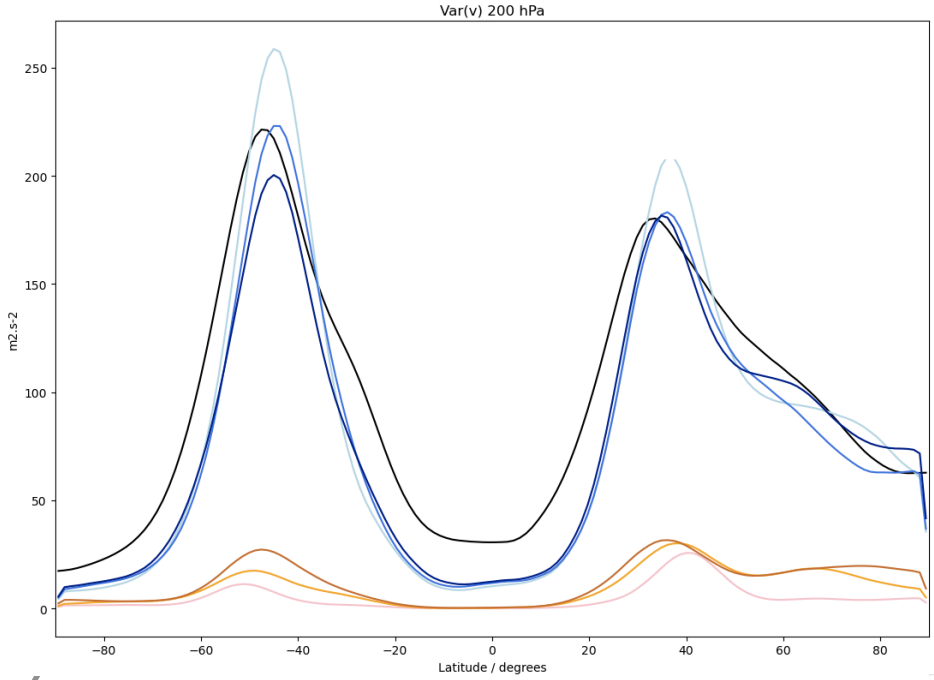
U zonal mean at 200 hPa



« Eddies » : Zonal mean of V daily variance at 200 hPa



Obtained by reducing the θ *target* profile static stability, by introducing the A parameter (Chang 2006):

$$\theta_{cible} = \bar{\theta}_{obs} - Az(p)$$

• Tests phase; varying parameters

(A, friction, land/sea contrast, wind damping at the top, relaxation time constant, boundary layer thickness...)

• Next: more vertical levels to better simulate the stratosphere

-> Obtain θ_{eq} to use dynamico only, with a low computing cost

-> Planned usage:

- Track the effect of tropical heating anomalies (MJO) on the North Atlantic (NAO)
- Study atmospheric blockings