Reducing altimetry small-scale errors to access (sub)mesoscale dynamics

Dream or reality ?

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Outline

- Mesoscale Capability Determination based on spectral analysis
- Mesoscale capability of Jason-2 1hz SLA
- Impact on small-scales error reduction in L3 Jason-2 SLA products
- SLA error to prescribed in data assimilation systems

1 -Mesoscale Capability Determination

- Exchange of energy between large and (sub)mesoscale geostrophic processes

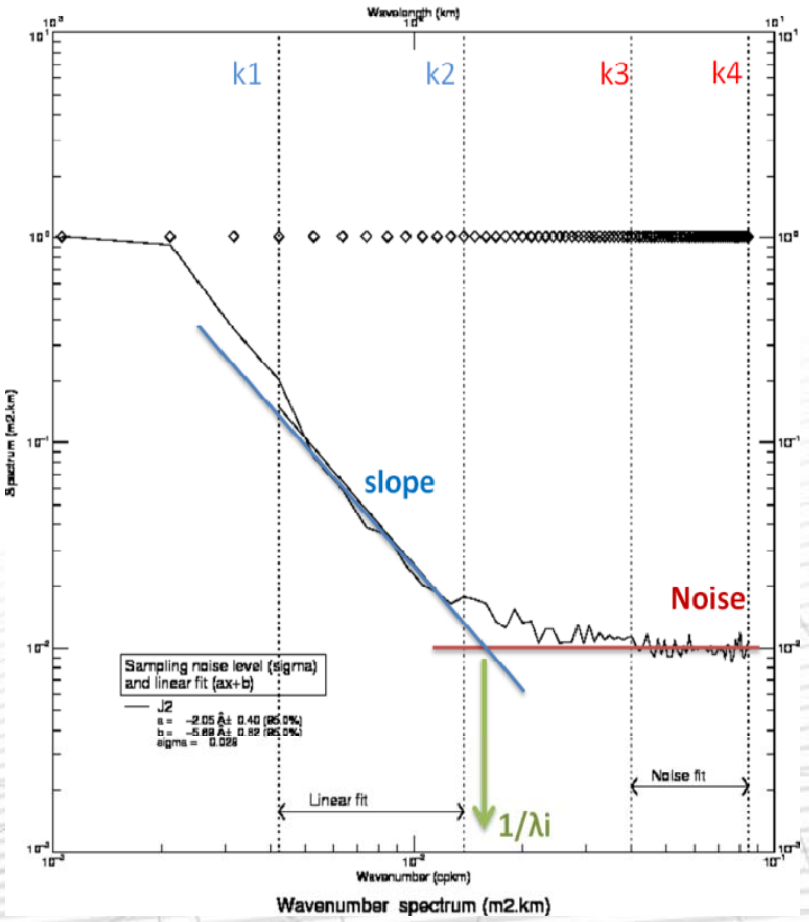
=>Energy cascades (turbulence theory)

=> **spectral slopes** in wavenumber spectra of SLA

- 1hz **altimeter noise** at small scales

Limiting access to oceanic HR processes

=> Determine until which length scale the signal/noise ratio is >1



1 -Mesoscale Capability Determination

•Exchange of energy between large and mesoscale geostrophic processes

=>Energy cascades (turbulence theory)

=> **spectral slopes** in wavenumber spectra of

•1

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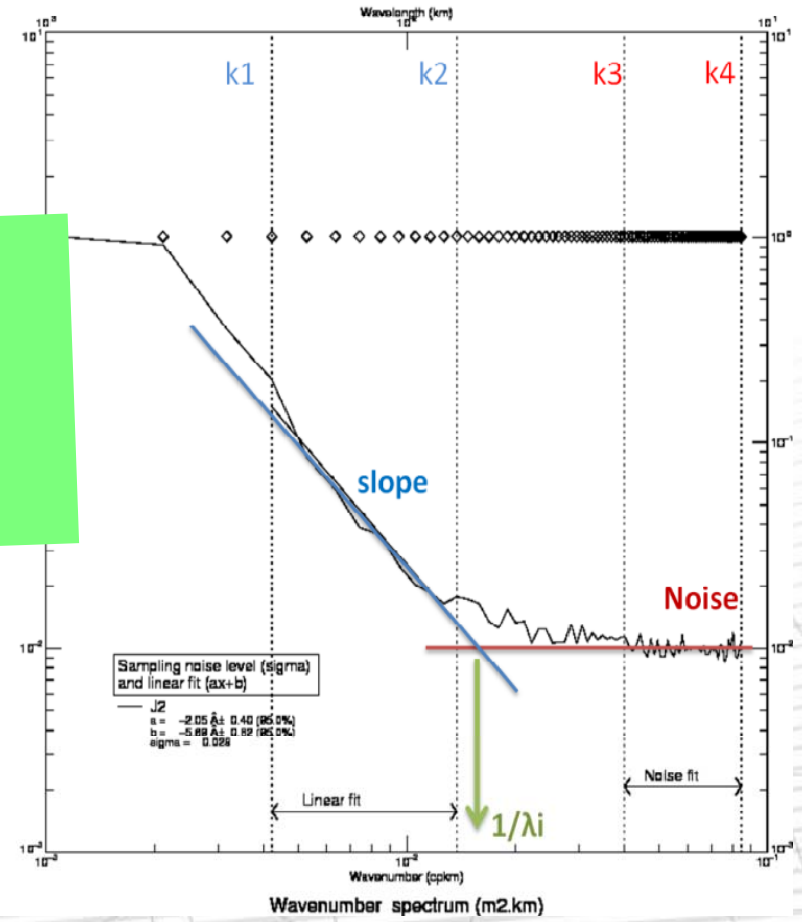
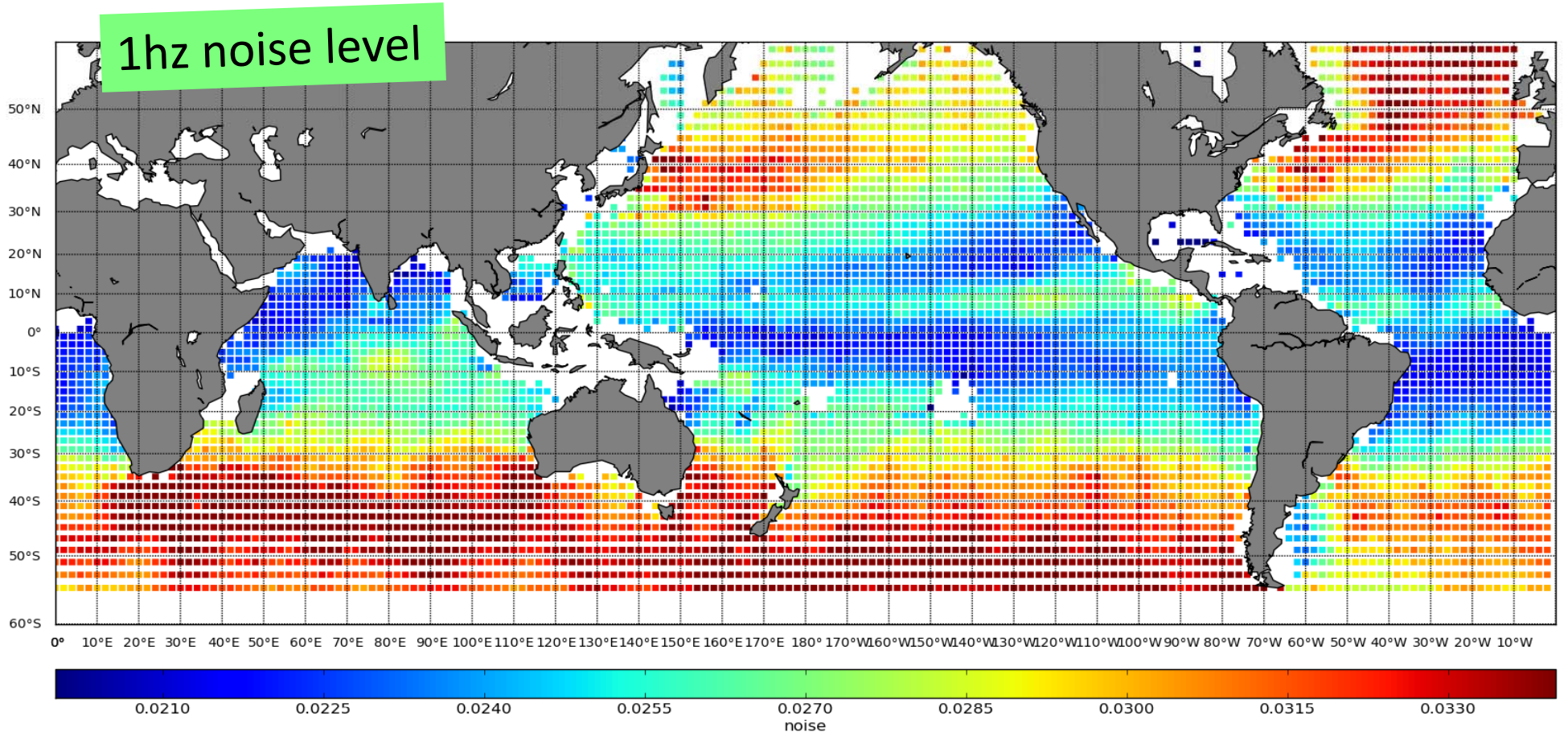
Wavenumber spectra are calculated
- •all over the World Ocean
- • in 10°x10° areas
- •over a 1-year period (2011)

=> Determine until which length scale the signal/noise ratio is >1

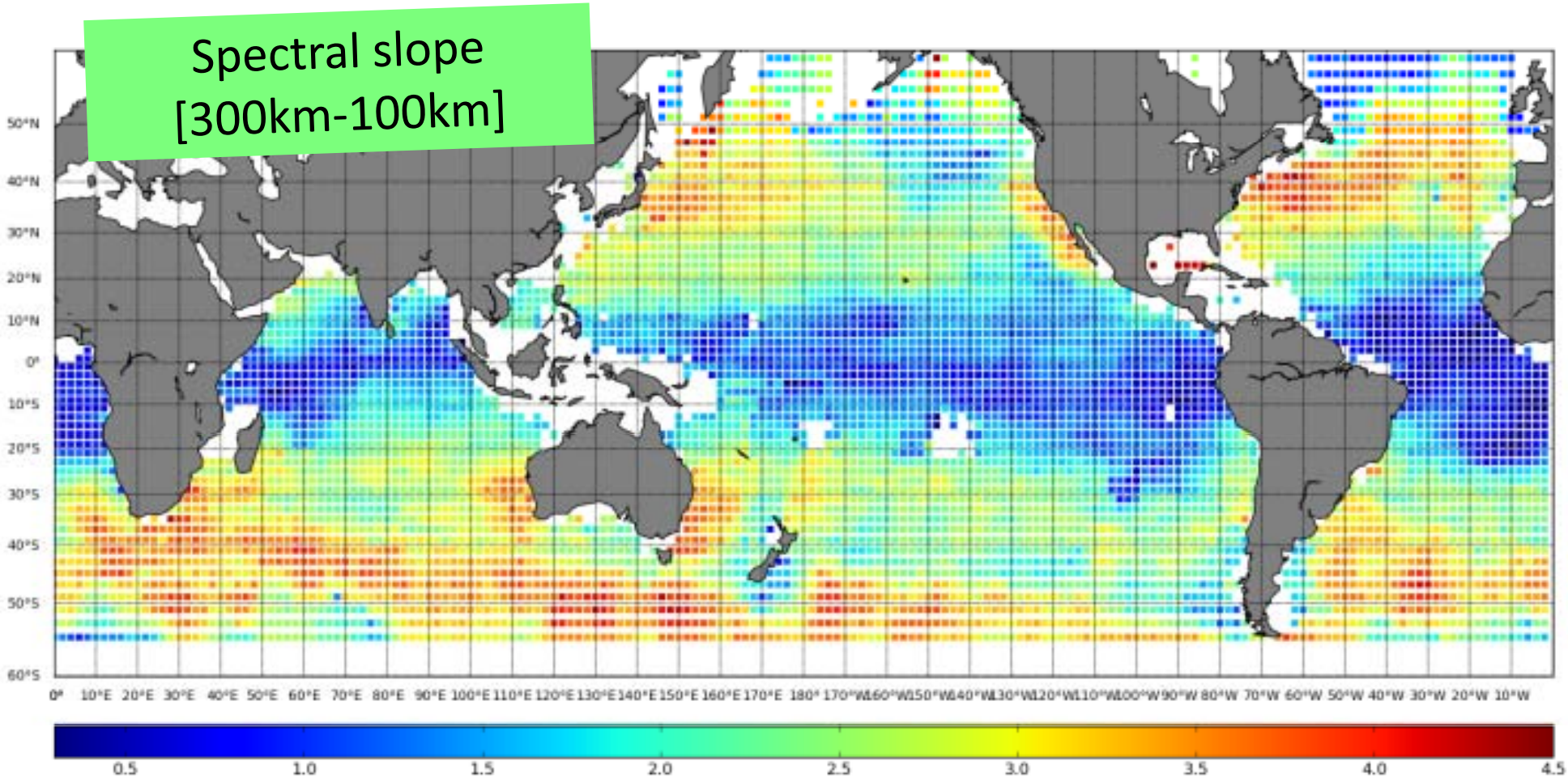


2- Mesoscale Capability of J2 1hz SLA



Contains both the **instrumental white-noise** (link with SWH) and **another error** which creates a hump of spectral energy at small length scales (see P.Thibaut ‘s talk just after)

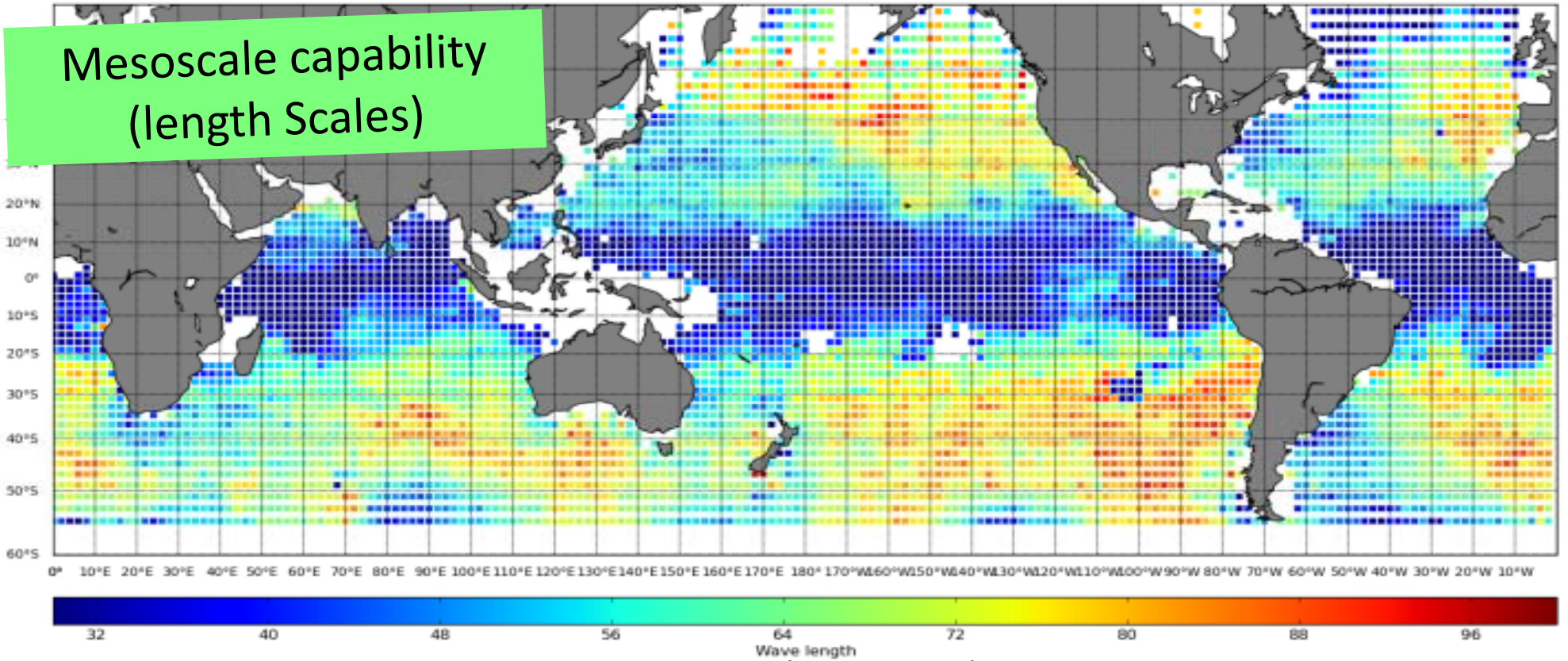
2- Mesoscale Capability of J2 1hz SLA



SQG theoritical slopes (-11/3) in the high EKE areas (Le Traon et al. 2008, Xu and Fu, 2012).

Low-slope areas still to be explained: internal waves, energy cascade at lower length scales ?

2- Mesoscale Capability of J2 1hz SLA

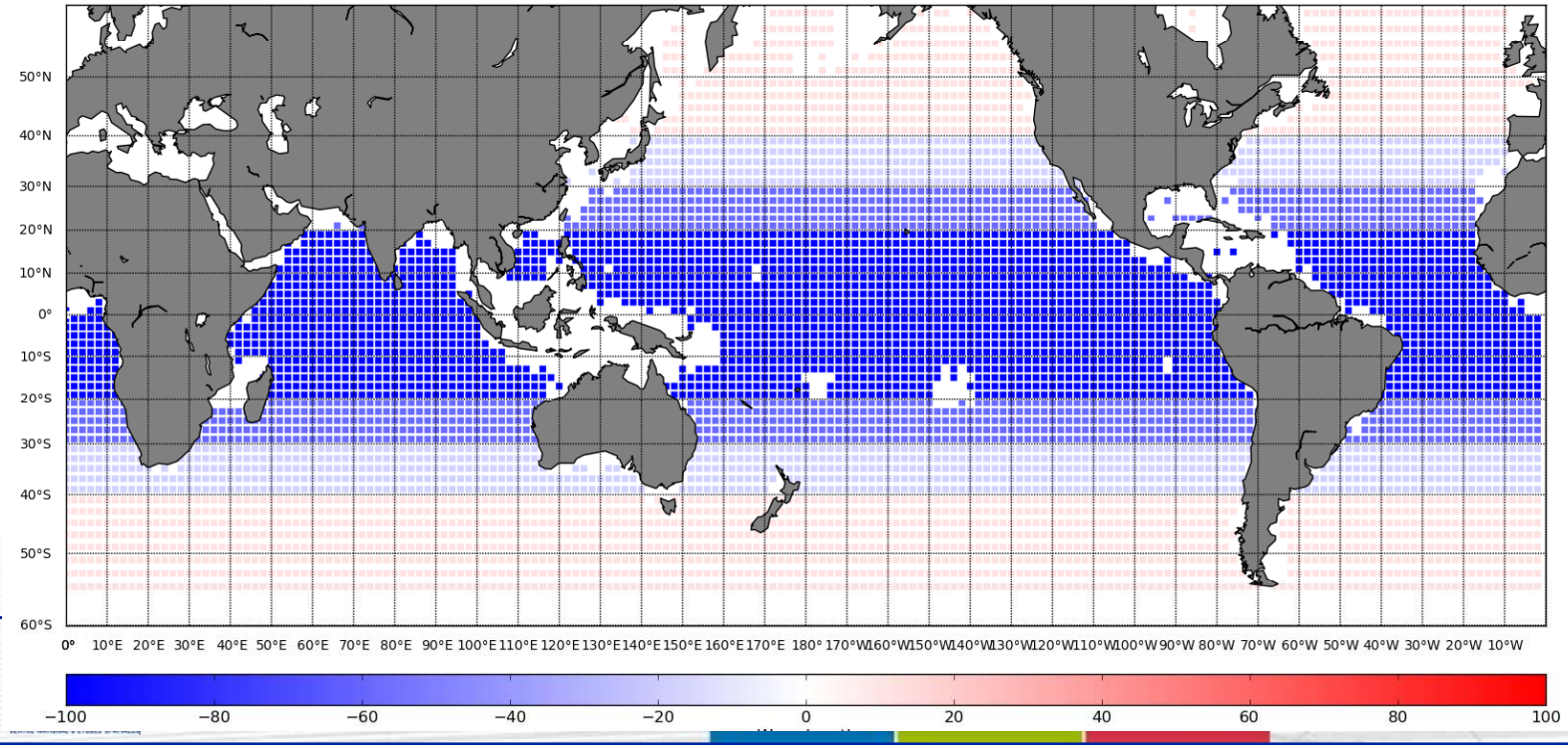


- Mean value ~**55km** ; lower In the tropics (20°S-20°N) and in the WBCs.
- Suspicious small-scale capability prescribed in areas where low spectral slopes are found.

3-Impact on small-scale error reduction in L3 SLA

To provide along-track higher resolution to users, future generation of MyOcean/DUACS SLA (March 2014) will be filtered taking into account this mesoscale capability estimation.

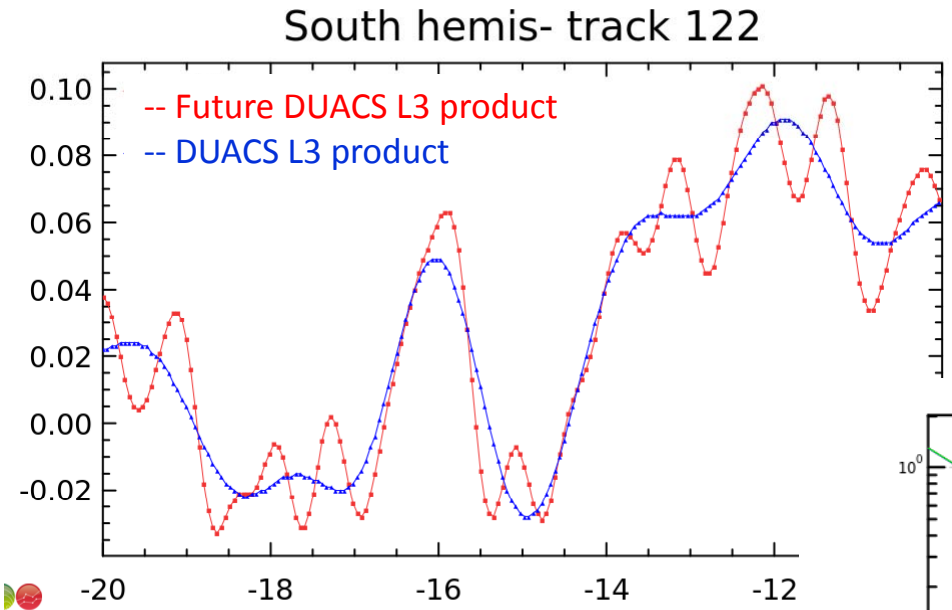
While low-slopes areas are not better understood, a **unique cut-off length of 65km** is decided -> already a big change in altimetry L3 SLA on AVISO



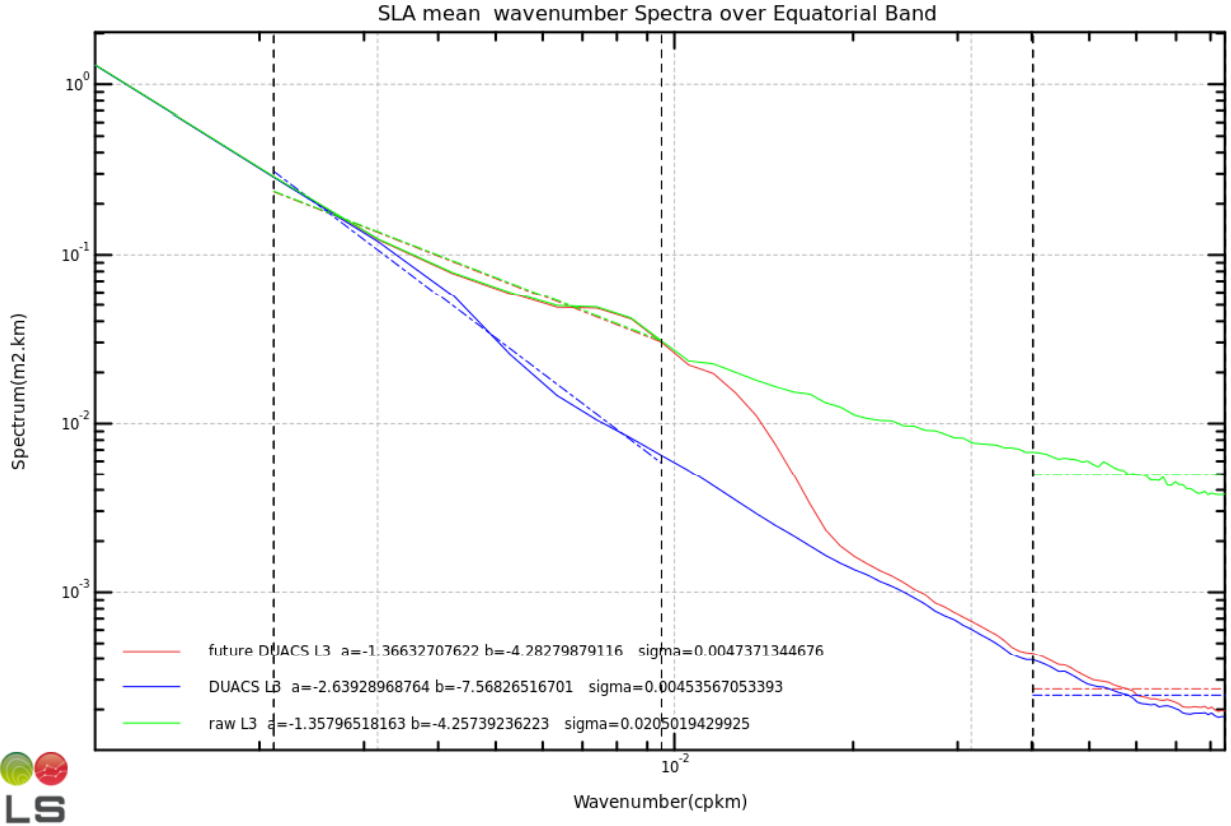
Diff NEW -OLD in filtering cut-off length.

Blue = reduced filtering

3-Impact on small-scale error reduction in L3 SLA



Future products will provide **higher resolution SLA profiles** below 30° in latitude.

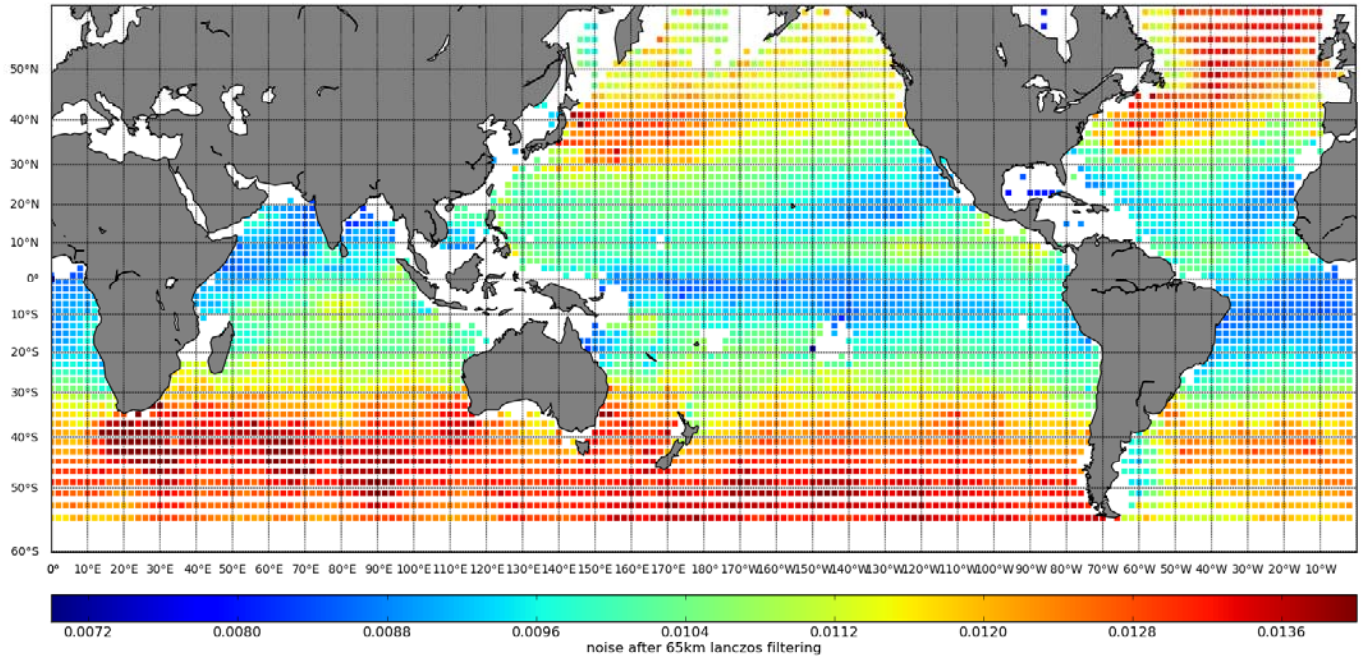


Additional meso-scale dynamics added : Original energy will be maintained until 80km approx.

4- SLA error to prescribe in DA systems

Instead of a **constant value,** data assimilation systems should use **a map** of SLA observation errors.

For users of future DUACS SLA : map of the remaining error level after filtering



Ideally, should be estimated **for each season** to follow error (and slope?) temporal change.

Thanks for your attention

poster #35

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