A new parameter to facilitate screening of coastal altimetry data and corrections

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CCI Sea Level

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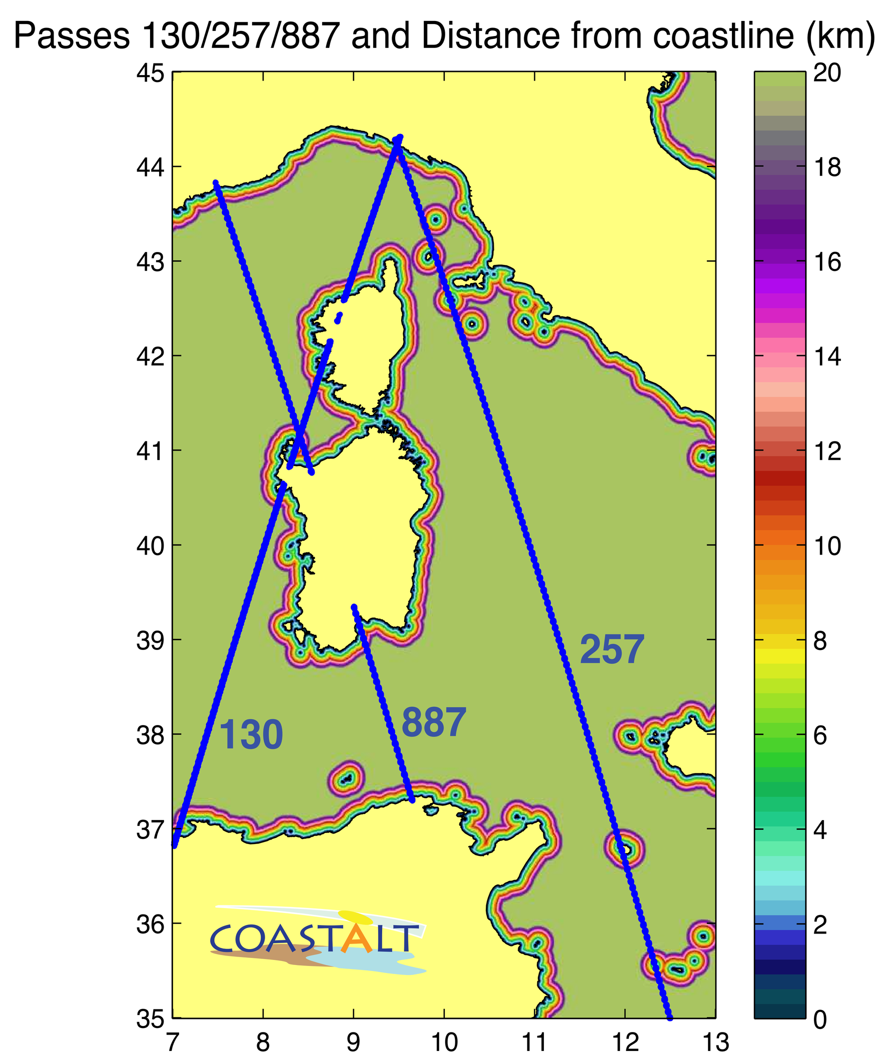


Why do we need a new parameter?

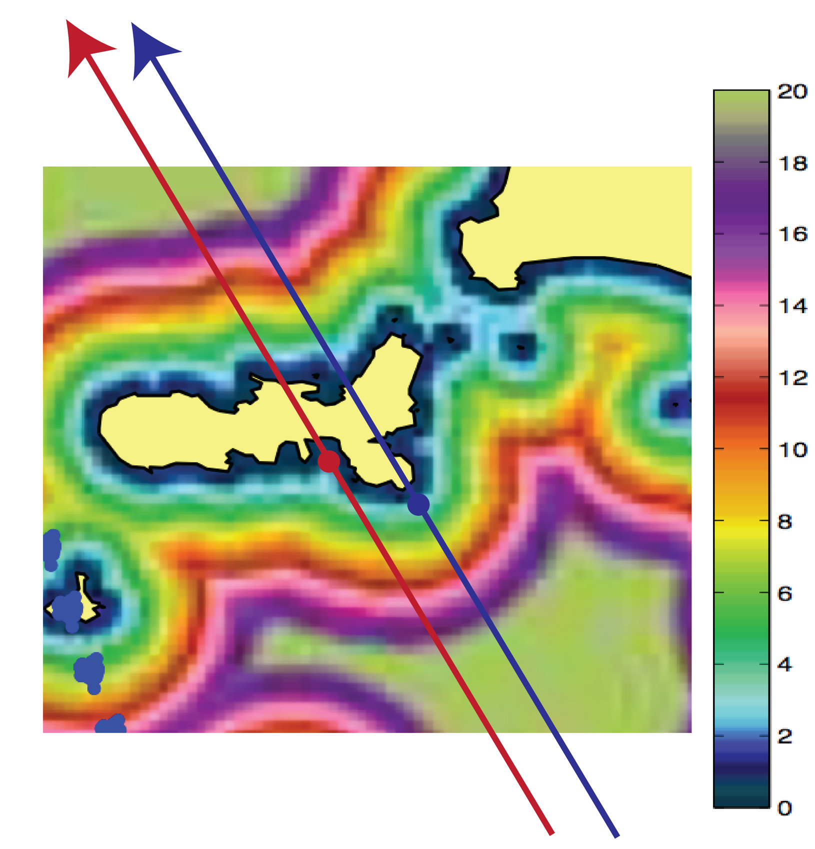
In order to determine how 'close to the coast' we can reach with climate-quality data, we need to screen data and corrections versus some independent variable.
'Distance from coast' is crude because it does not capture the enormous variability in 1) morphology and 2) coastal conditions

Coastal Proximity $\mathcal{P}$

A new parameter to be used as independent variable:

- initially aims at capturing differences in coastal morphology
- later, if possible, will include peculiarities in coastal ocean (for instance peculiarities in coastal wave field)

The $\mathcal{P}$ parameter, when used in place of distance from coast, will help to **improve the screening of sea level data for climate applications** (one of the objectives of the ESA Sea Level CCI Project)



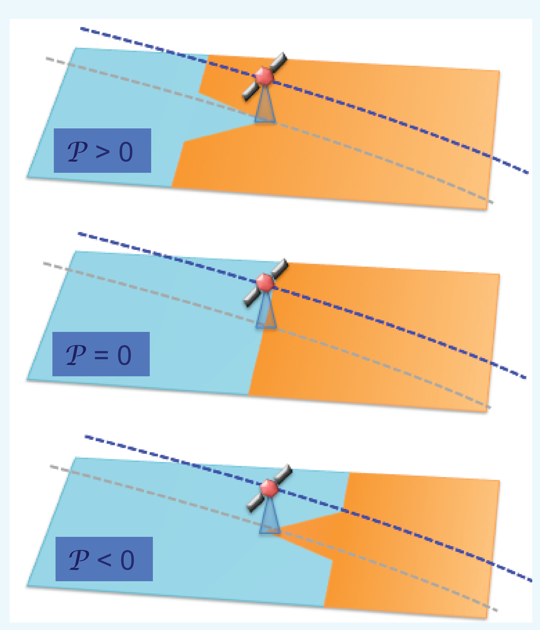
Example: two ground points near Elba island (in blue and red in the figure): they are at same distance from coast, but subject to very different conditions: one is close to a cape, another in a recessed bay

How we designed $\mathcal{P}$

- increasing from ocean to land
- smaller over tips/peninsulas, larger in bays

For easier comparison with distance (zero at coastline), $\mathcal{P}$ is rescaled to be:

-1	over open ocean
0	at idealized, straight coastline
1	inland

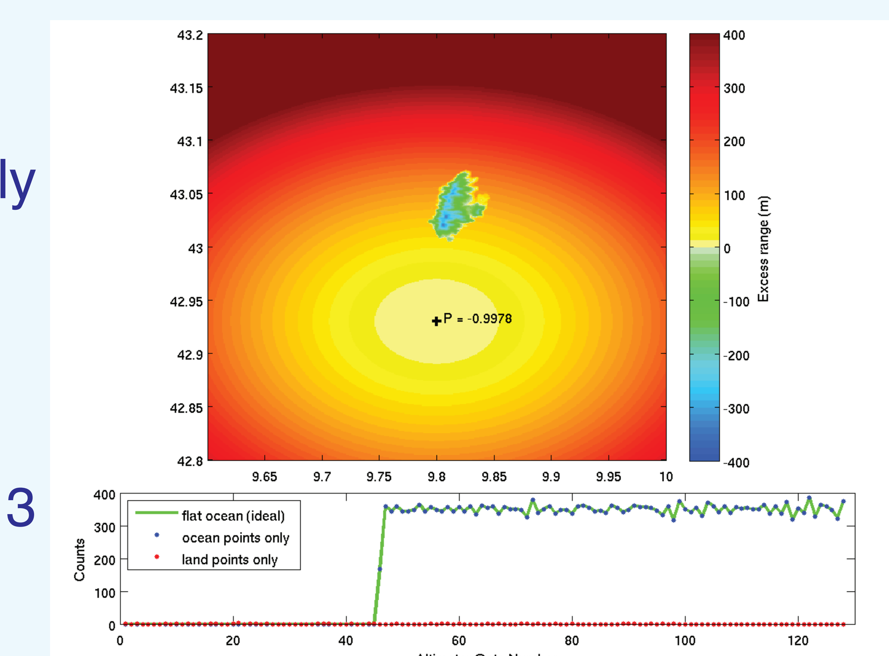


How we compute $\mathcal{P}$

To simulate the effects of land on waveforms we fly a virtual altimeter over a good DEM:

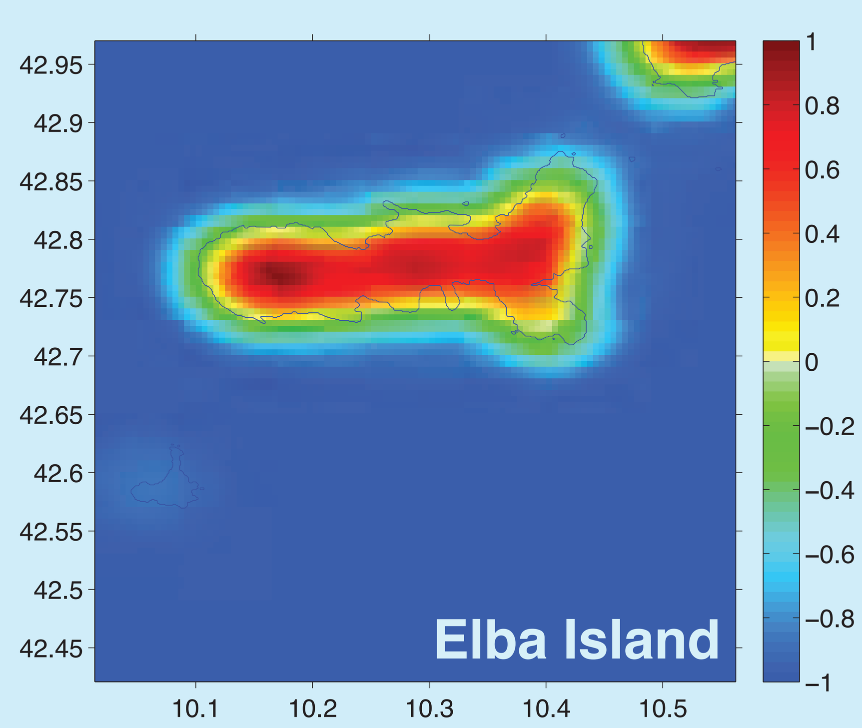
ACE2 produced by De Montfort University

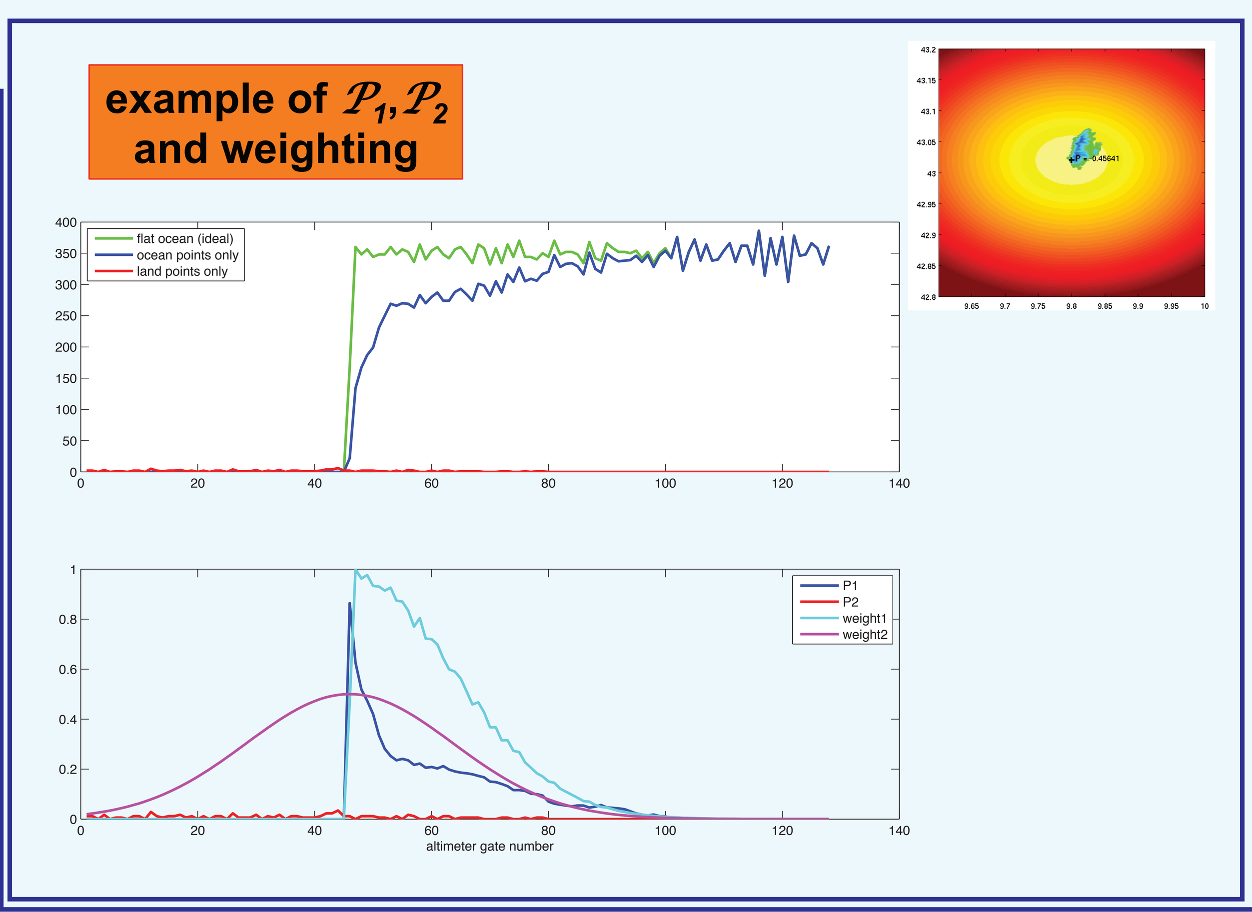
We use the highest ACE2 resolution available, 3 arcsec, i.e. ~90 m at equator.



RESULTS

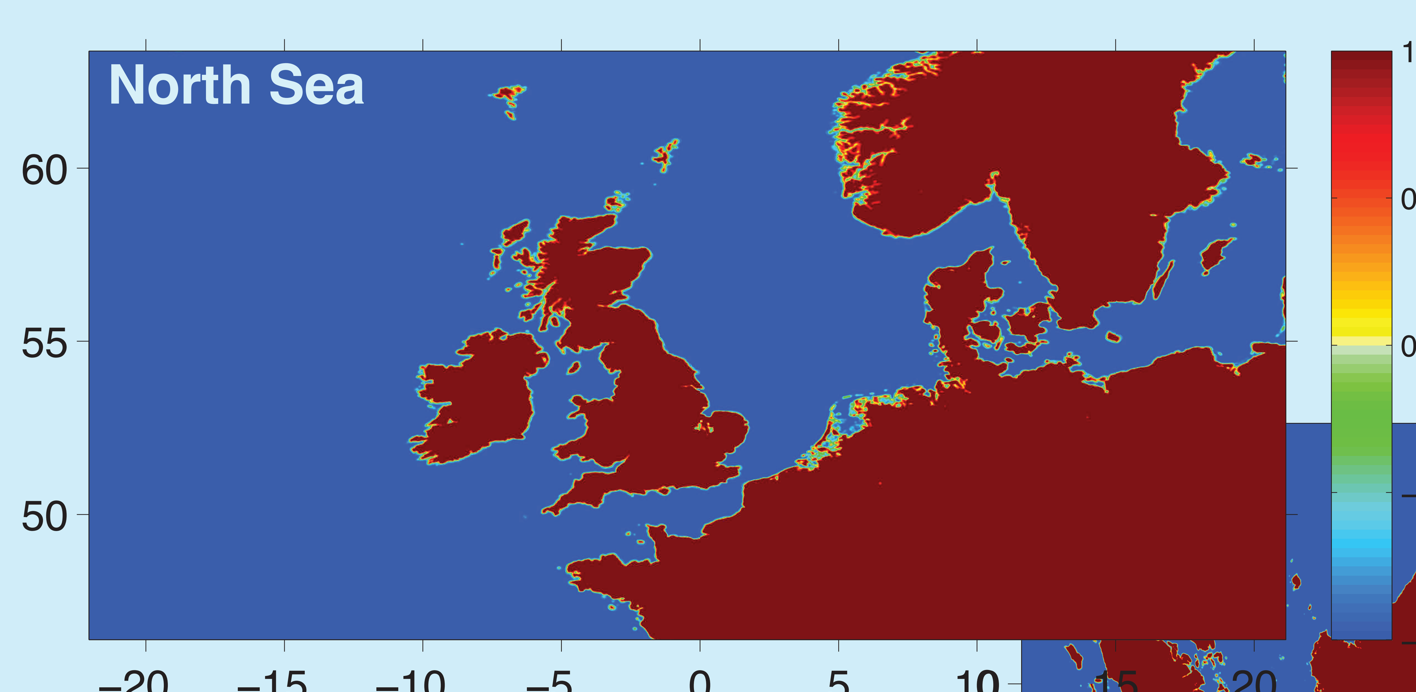
A few example maps of $\mathcal{P}$

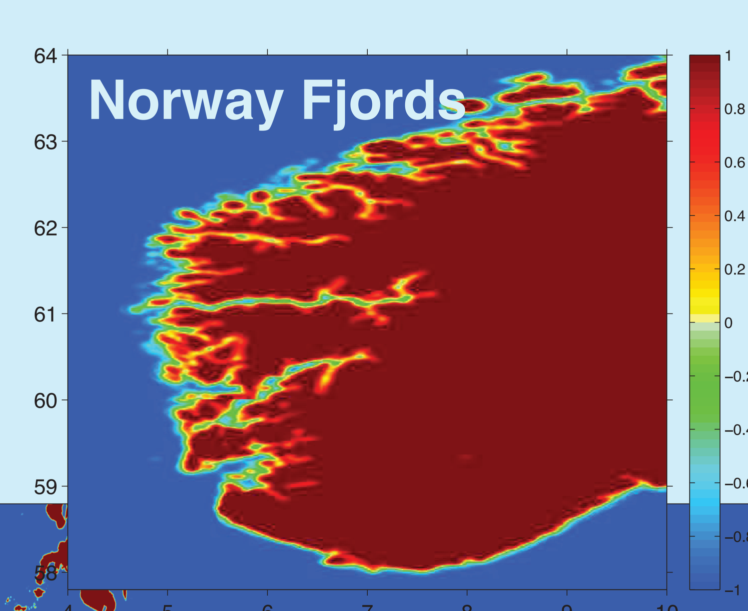


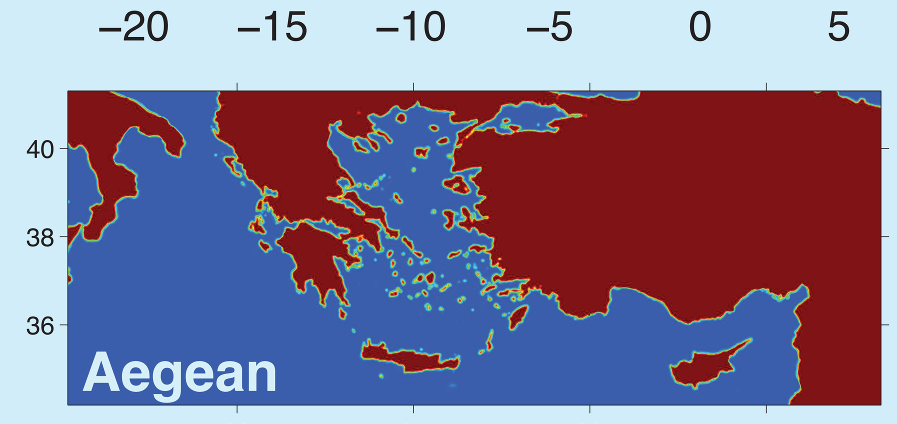


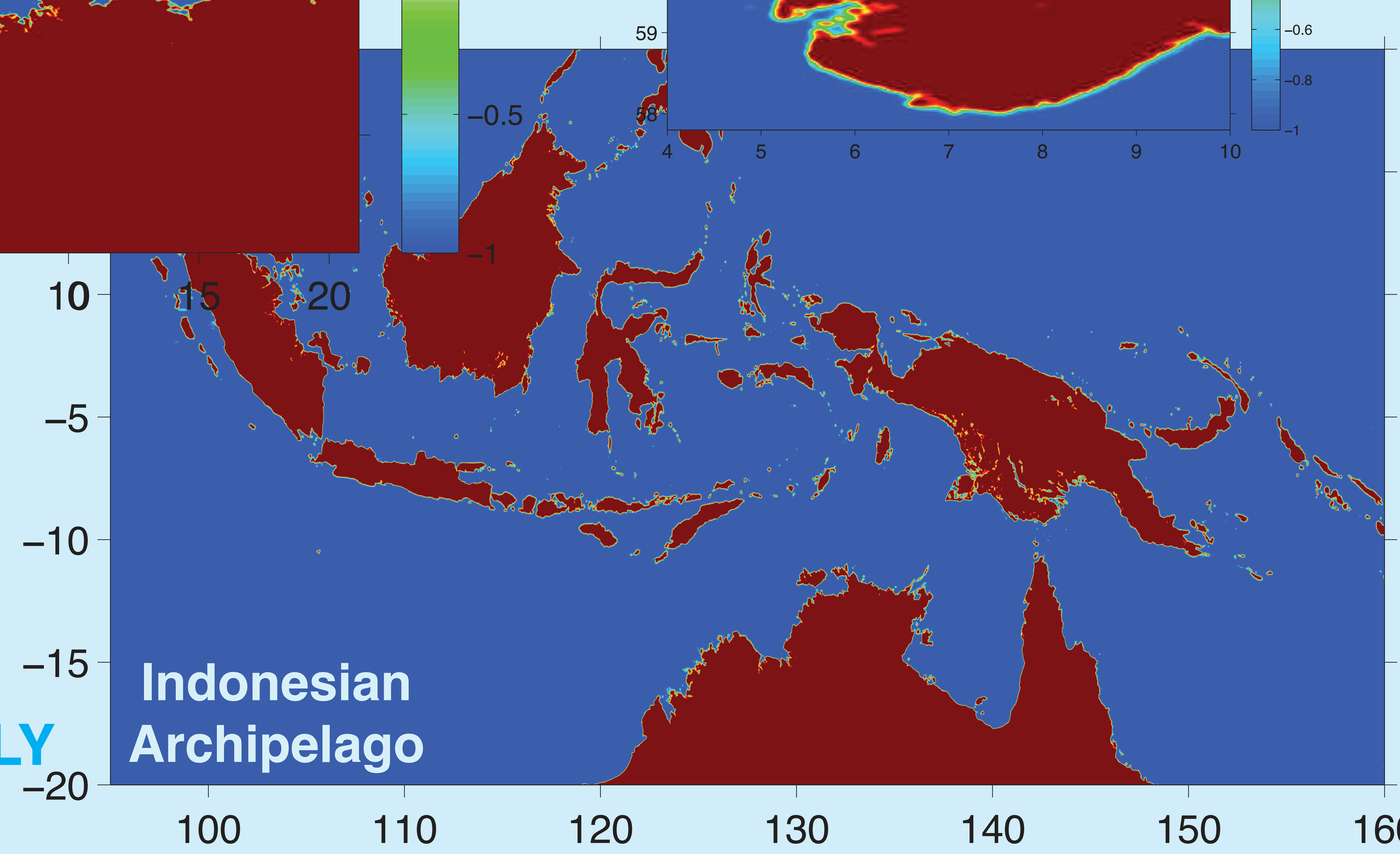
Computing $\mathcal{P}$ - two contributions:

$\mathcal{P}_1$ - power deficit due to "missing ocean"
land, even if it is at z=0, will usually have much lower backscatter than ocean (there are exceptions, but they are difficult to model!)
$\mathcal{P}_2$ - land returns in various gates
i.e. we get echoes from land elements in various gates (before and after leading edge) depending on the land height
Those are weighted according to how close they are to the waveform leading edge









We have computed $\mathcal{P}$ GLOBALLY at 0.01° resolution (~1Km)

How we plan to use $\mathcal{P}$

We are hoping that screening parameters/corrections against $\mathcal{P}$ will make them more monotonic - and allow a easier placement of acceptance thresholds (this validation work has just started)

Acknowledgments:
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The ACE2 DEM is produced by Philippa Berry and Richard Smith of EAPRS Laboratory, De Montfort University, Leicester, UK under ESA funding. Reference:
R.G. Smith & P.A.M.Berry, ACE2: Global Digital Elevation Model, Use Guide, available from: http://tethys.eaprs.cse.dmu.ac.uk/ACE2/docs/ACE2_userguide.pdf

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