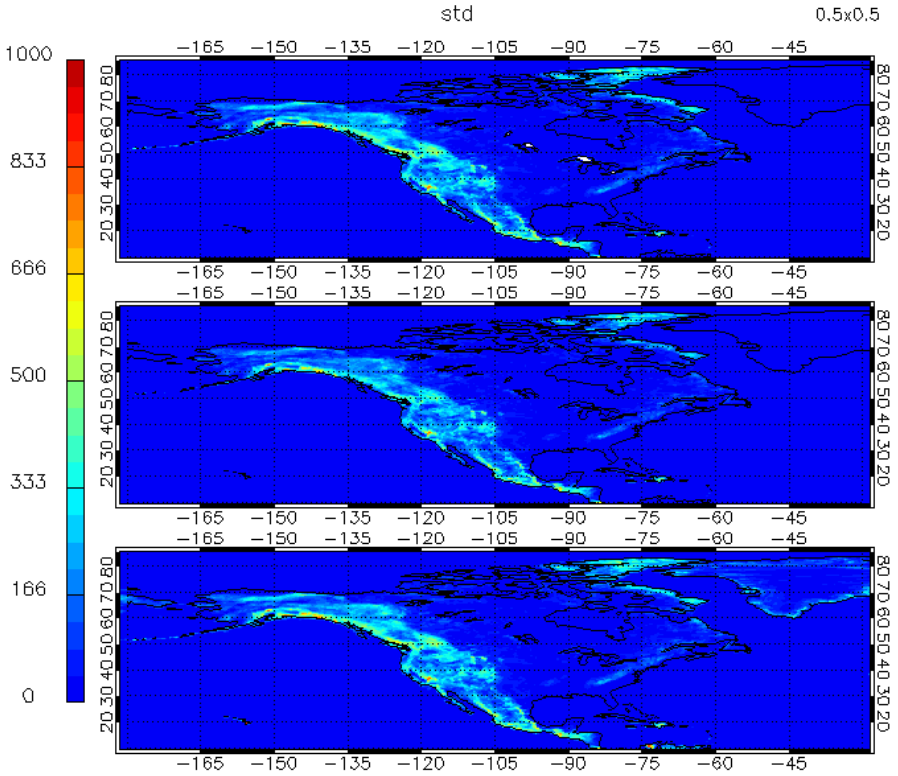
STD_ELEV & N_melt

Brief Summary

The snow depletion parameterization includes a parameter (N_melt), that varies spatially. N_melt is a function of topographic variability. The raw topography (elevation) dataset has 1km spatial resolution. Ideally, to calculate subgrid variation, the subgrid dataset should be of much higher resolution. But how high is enough?

Comparing 1km to 5km std_elev

std_elev

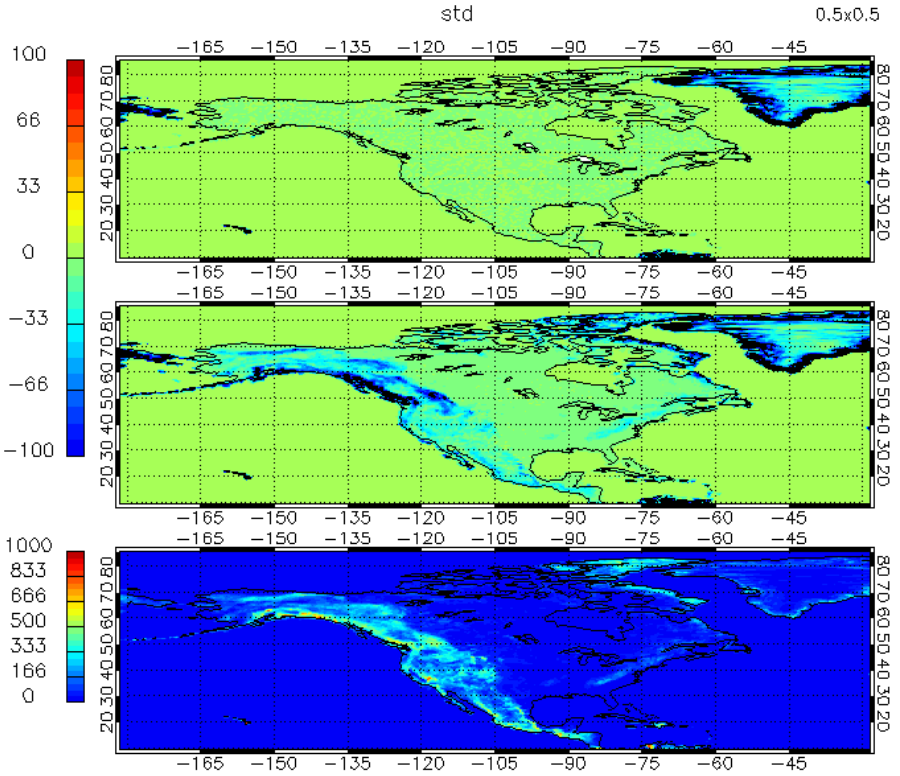


For these plots, I calculated the standard deviation of elevation (std_elev) from the 1km data using a simple script to bin the data in each gridbox (top plot). This should look like the std_elev from the surface data file calculated using the mapping files (bottom plot). Then I used the same script on 5km data (middle plot).

Comparing 1km to 5km std_elev

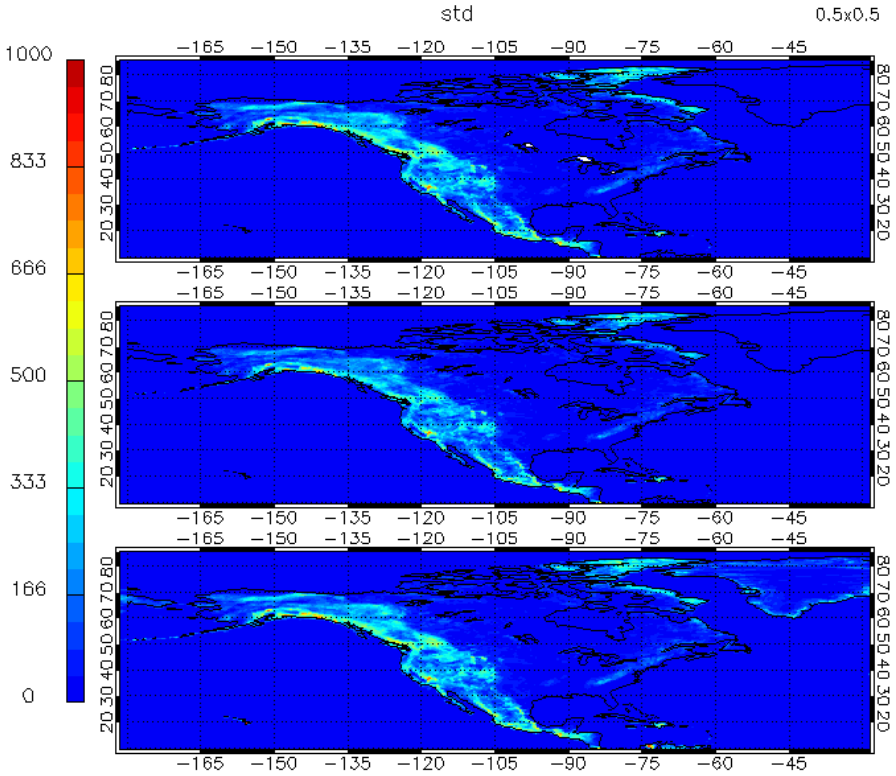
Difference std_elev

The difference plots show that my script gives about the same answer as the mapping files (compare top to bottom). In this case, greenland was not on the 1km file, so ignore greenland. The middle plot shows that the reduced spatial resolution causes some differences, with larger differences associated with larger absolute values.

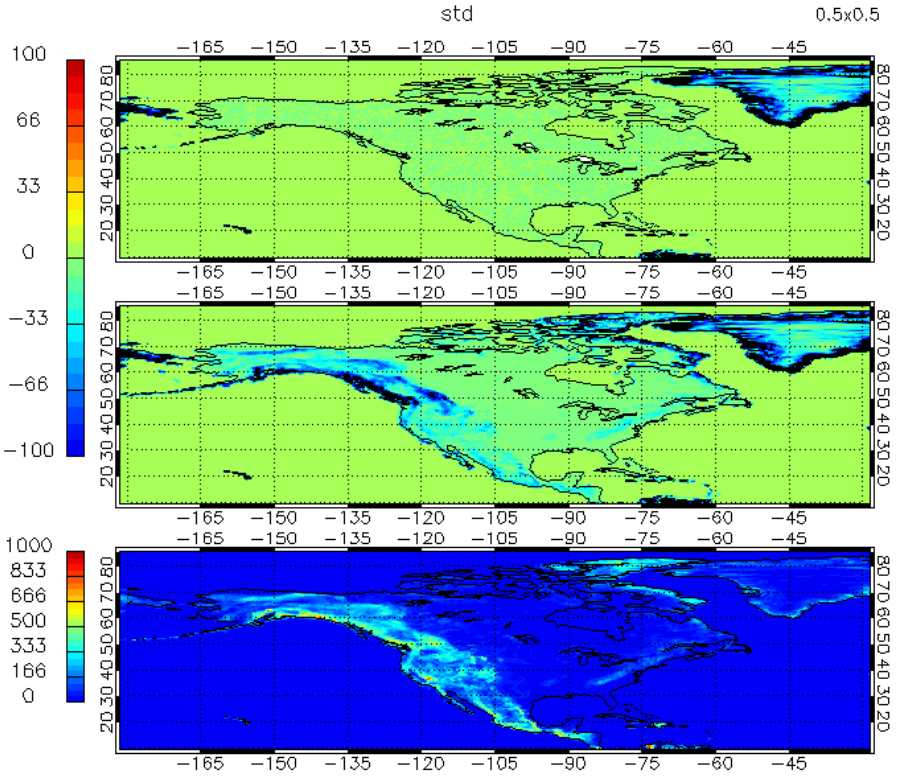


Comparing 1km to 5km std_elev

std_elev



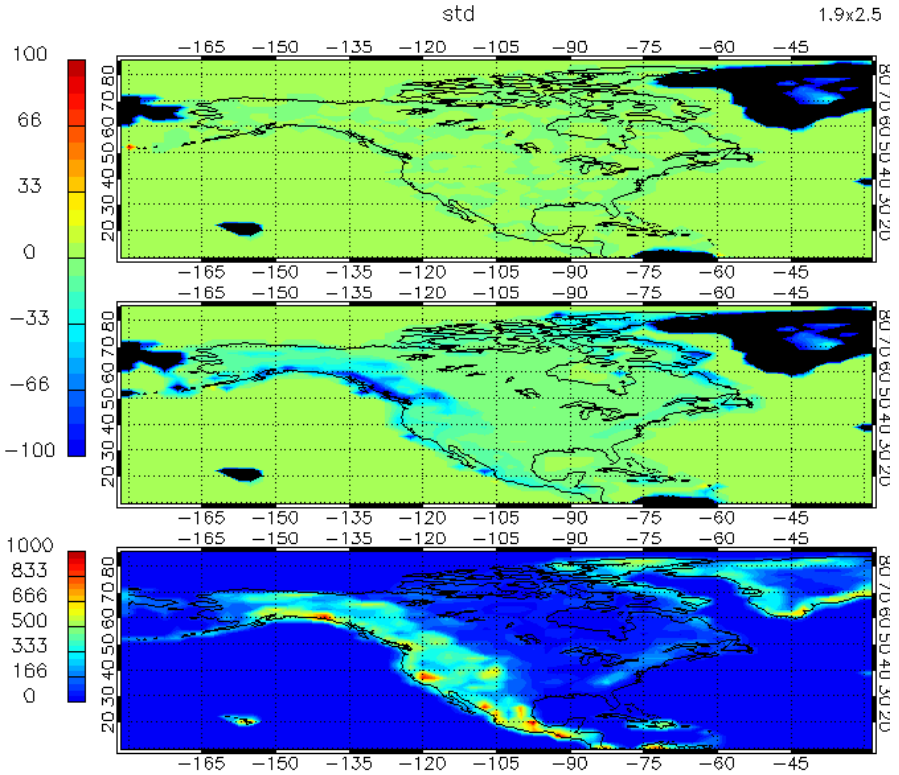
Difference std_elev



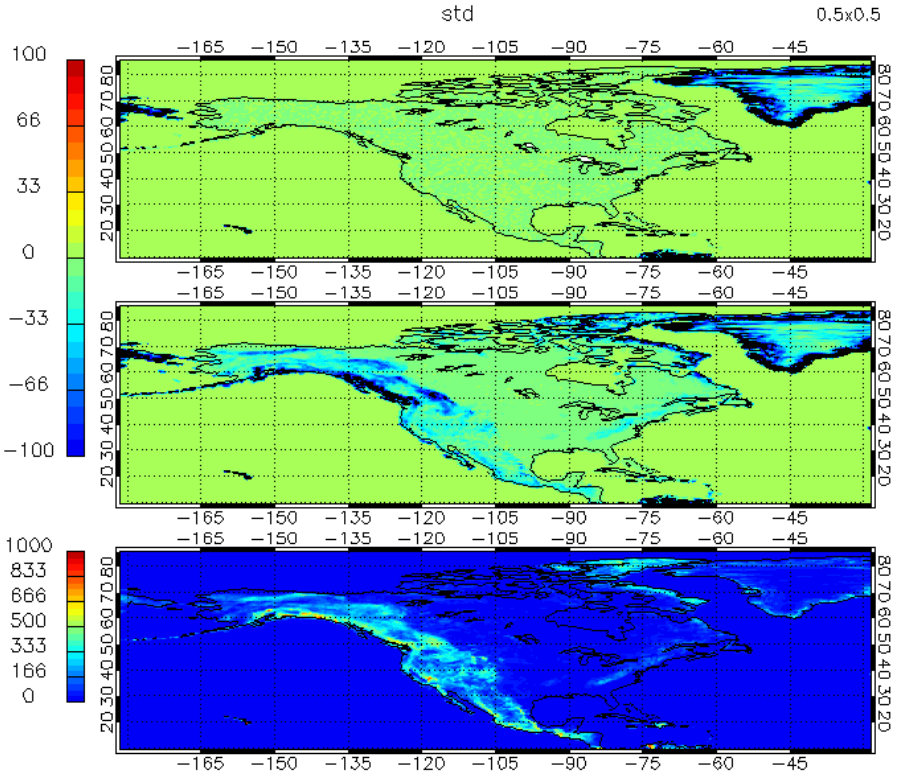
Top: my offline calculation of std_elev from 1km
Middle: my offline calculation of std_elev from 5km
Bottom: from surface dataset

Comparing 1km to 5km std_elev

1.9x2.5



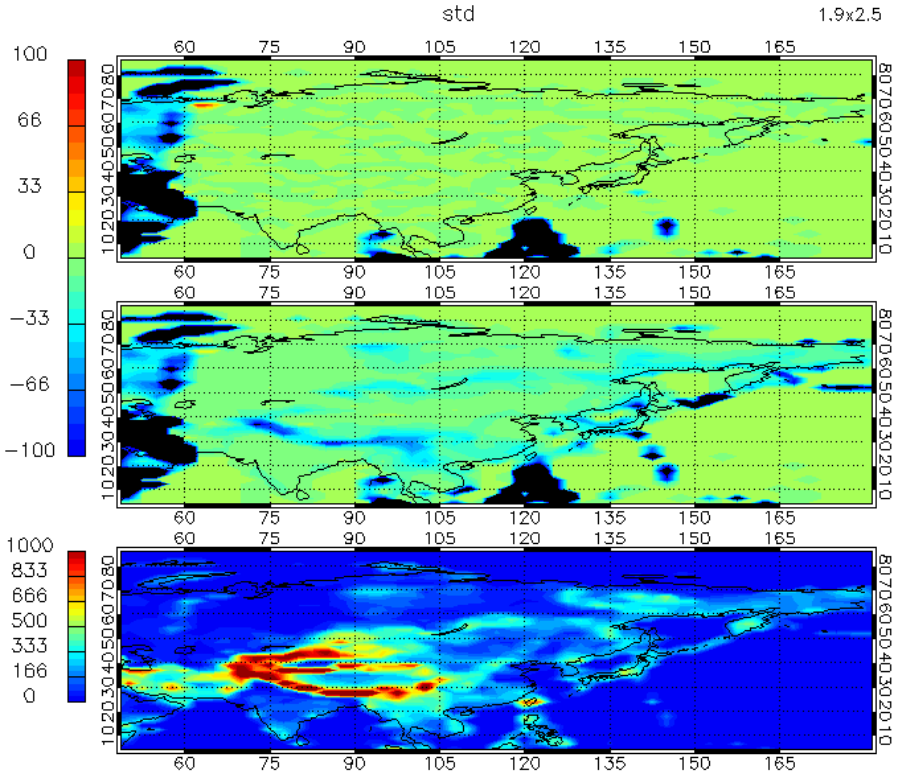
0.5x0.5



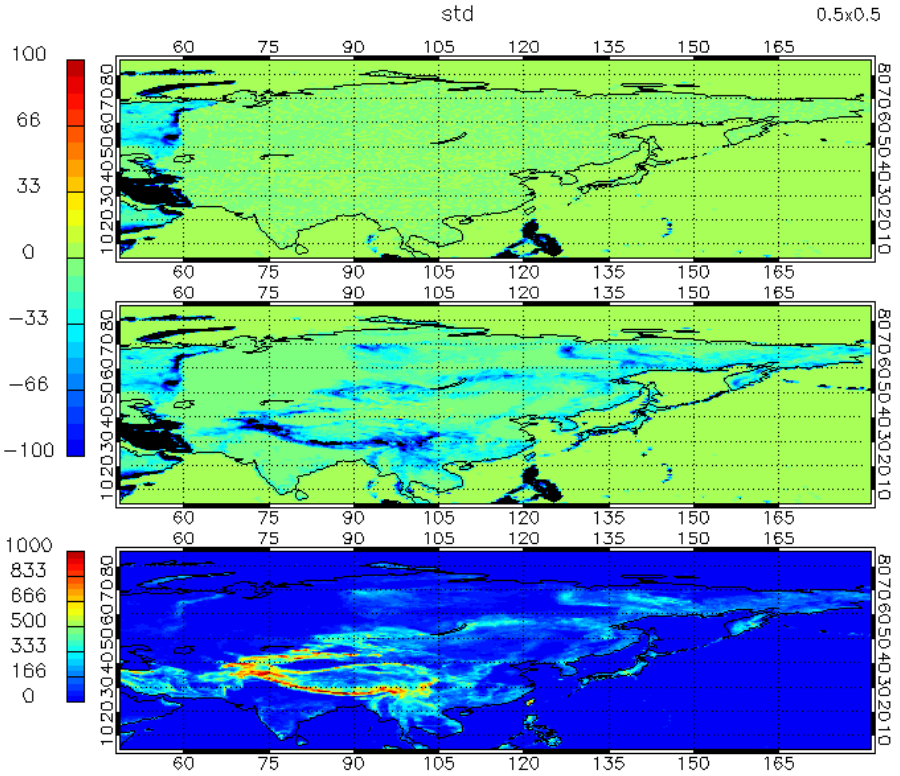
Comparing different resolutions. One would expect that higher resolution data (e.g. 0.5degree) would have larger differences, b/c there is proportionally more data being lost by the averaging.

Comparing 1km to 5km std_elev

1.9x2.5



0.5x0.5



Comparing different resolutions

Comparing 1km to 5km std_elev

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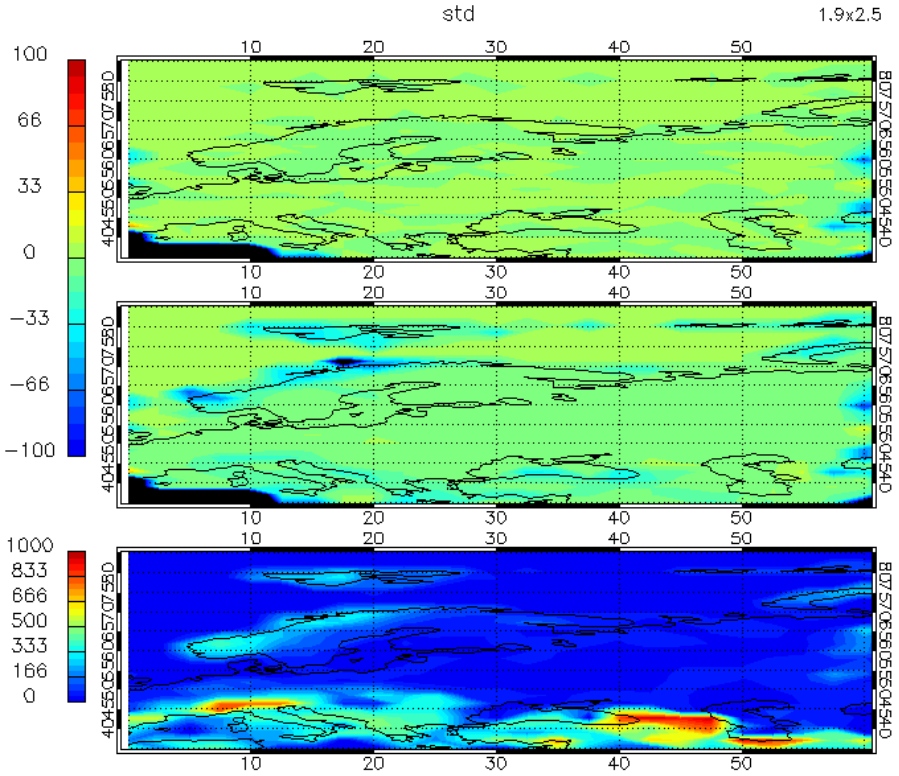
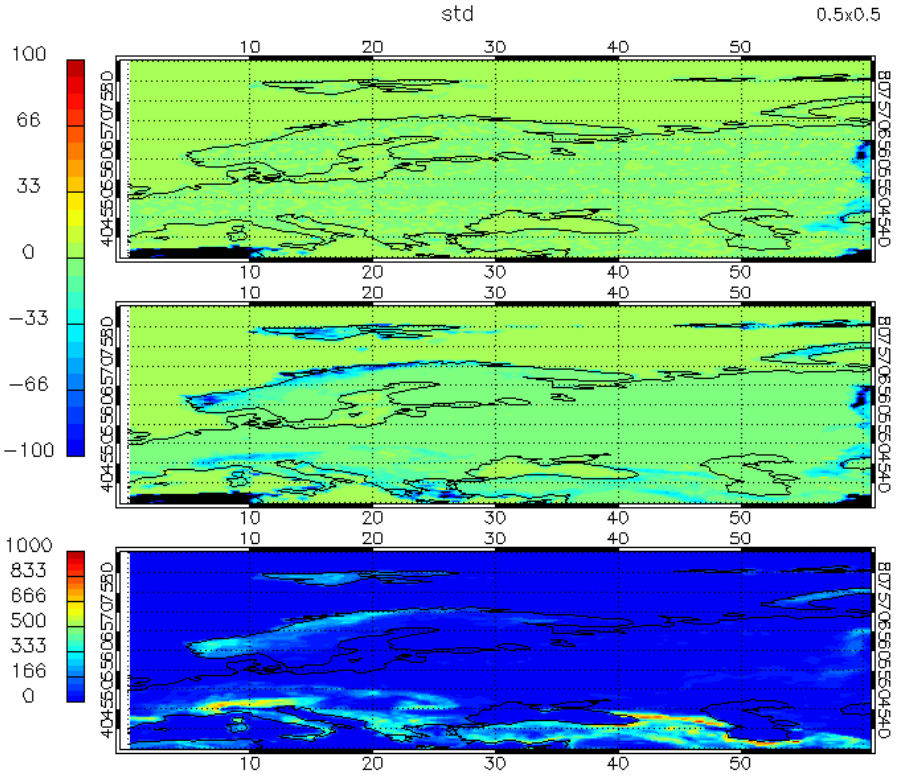


0.5x0.5



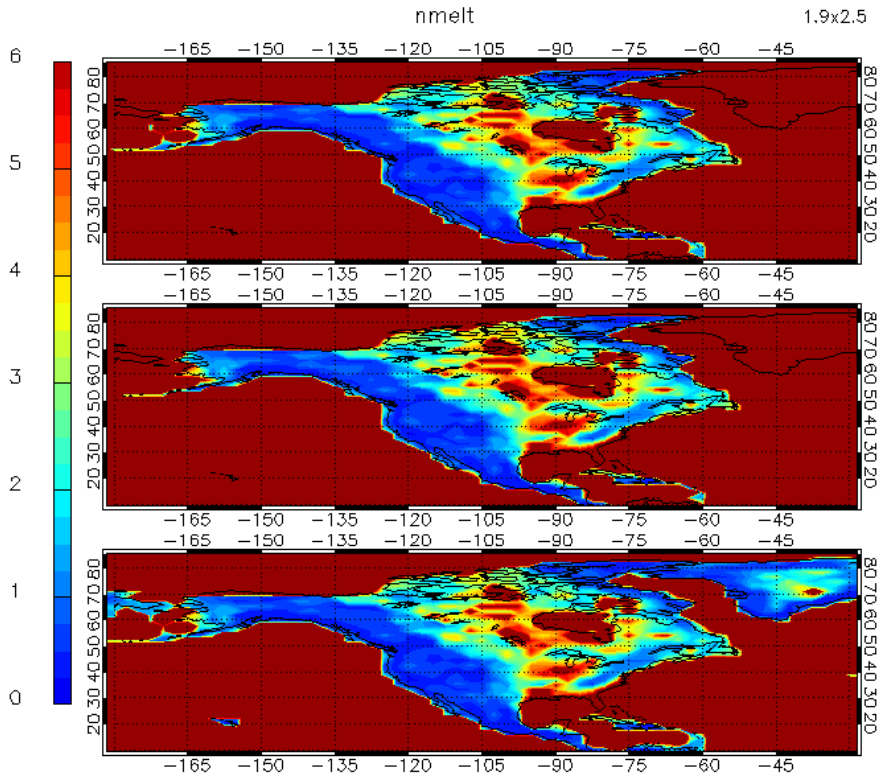
Comparing different resolutions

Nmelt = 200/max(10,std_elev)

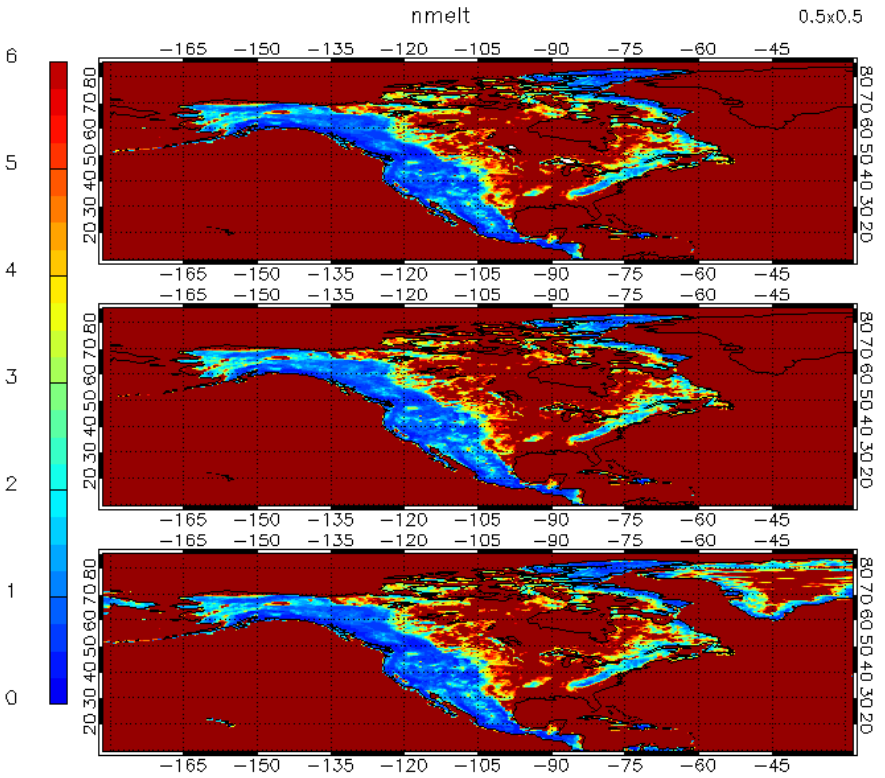
It is not obvious how significant the differences are. N_melt is the actual parameter used by the parameterization. Next, the absolute values are plotted (not the differences). By eye, they all look pretty similar, but again, simulations would need to be run to quantify the impact of the coarser spatial resolution raw data.

Comparing 1km to 5km nmelt

1.9x2.5



0.5x0.5



Comparing different resolutions

Comparing 1km to 5km nmelt

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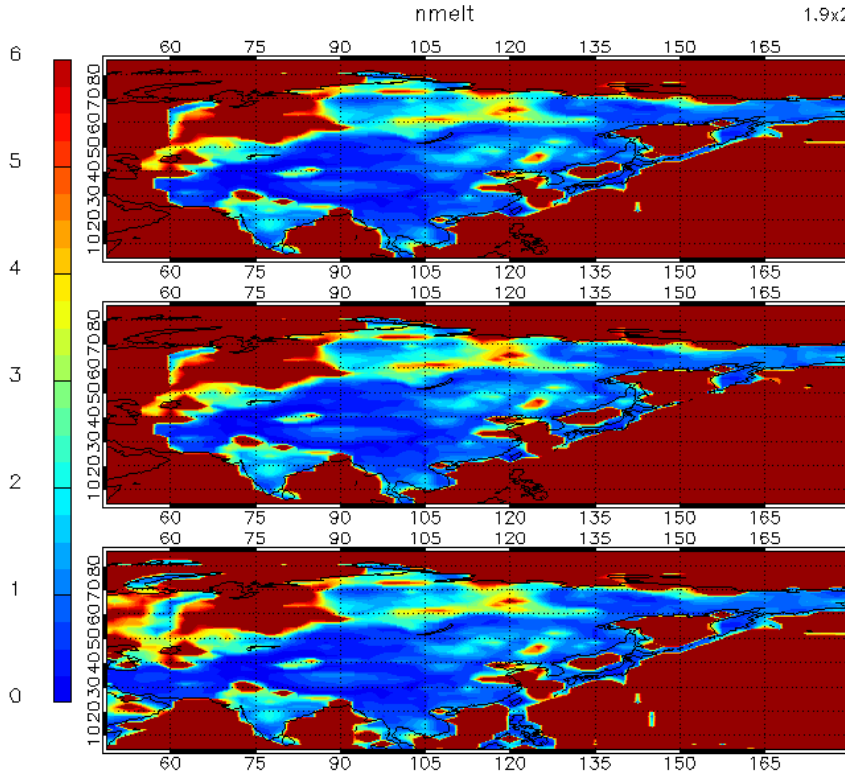

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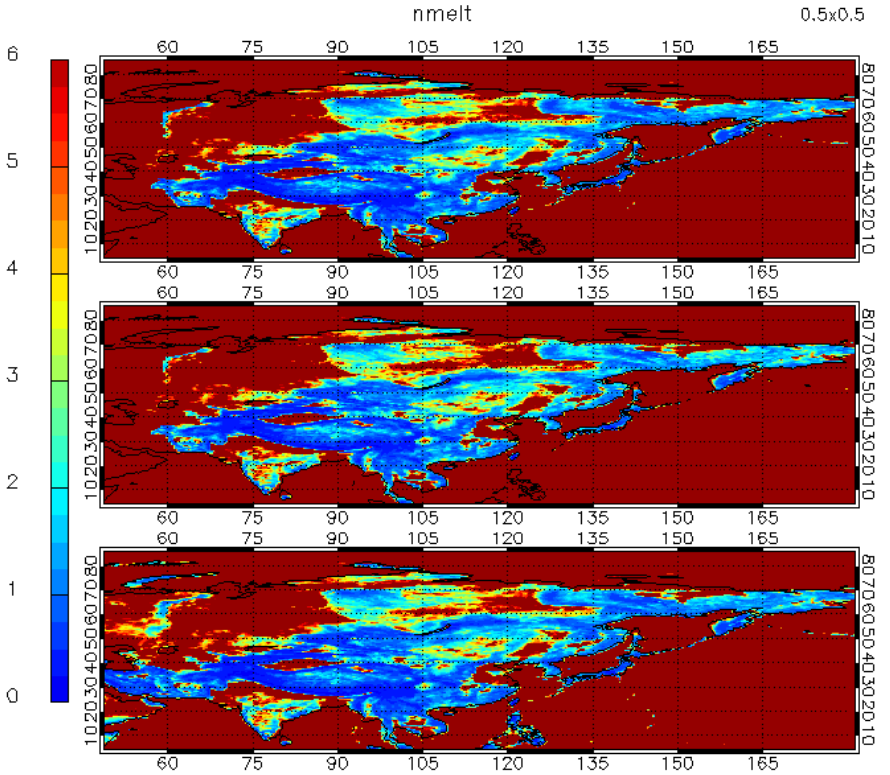

Comparing different resolutions

Comparing 1km to 5km nmelt

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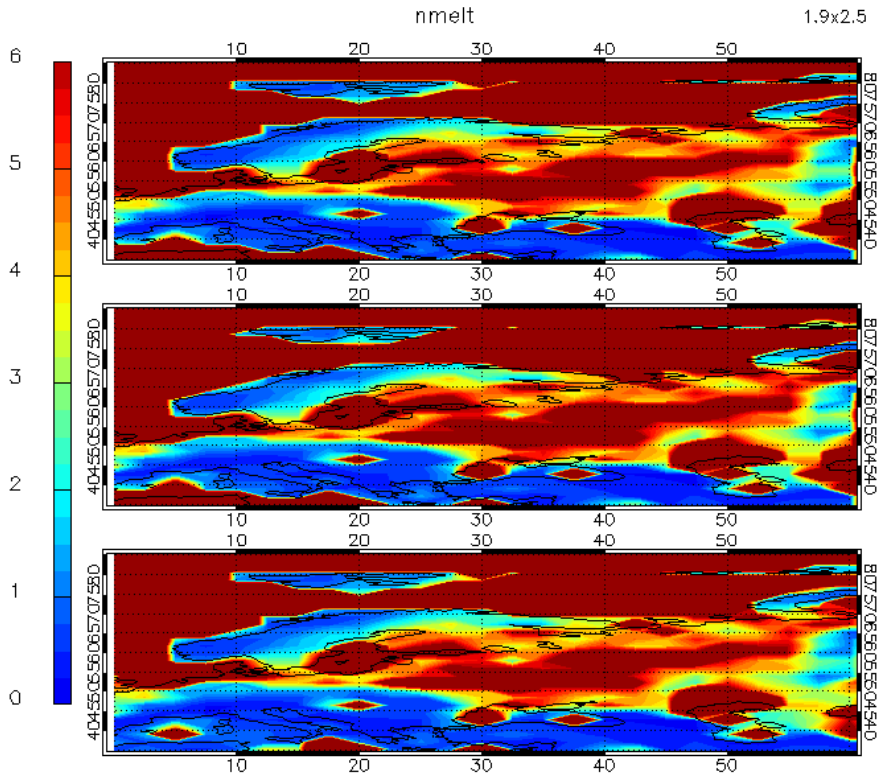

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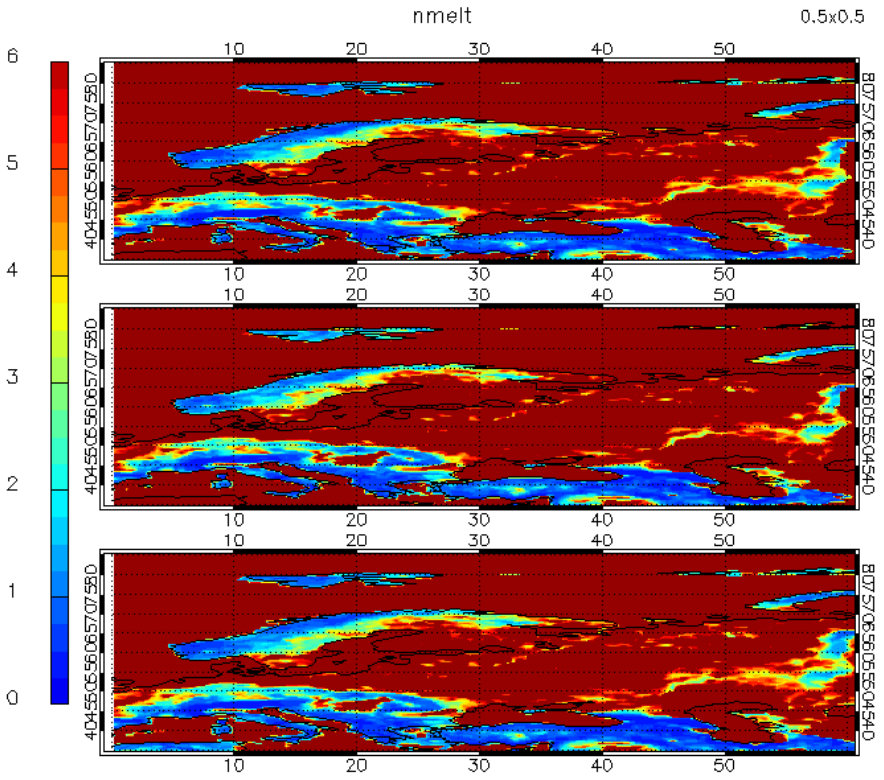
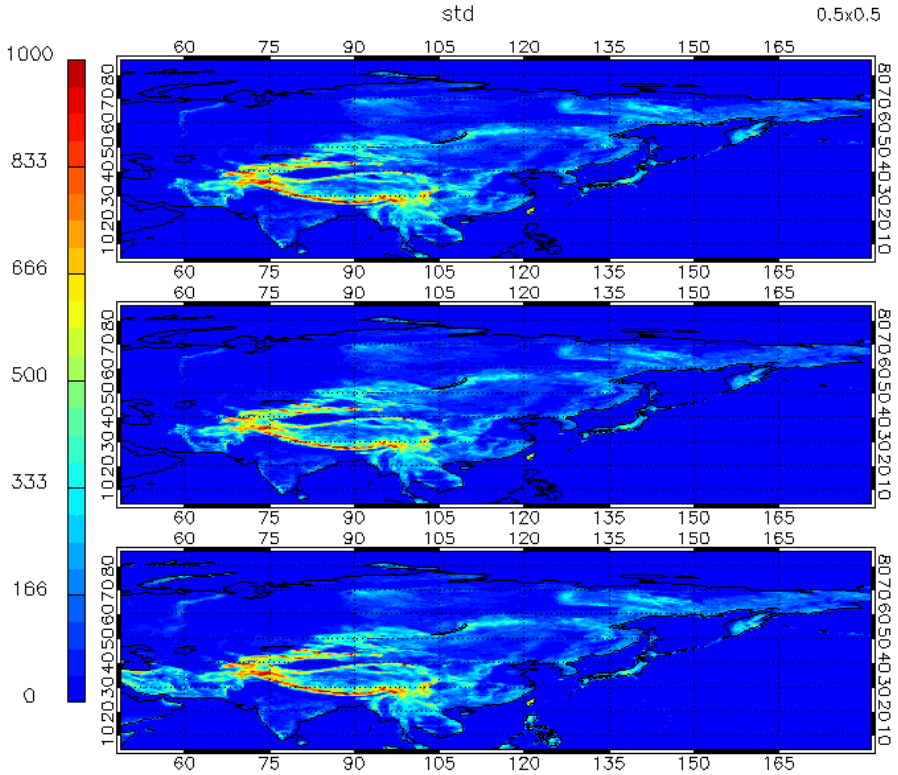


Comparing different resolutions

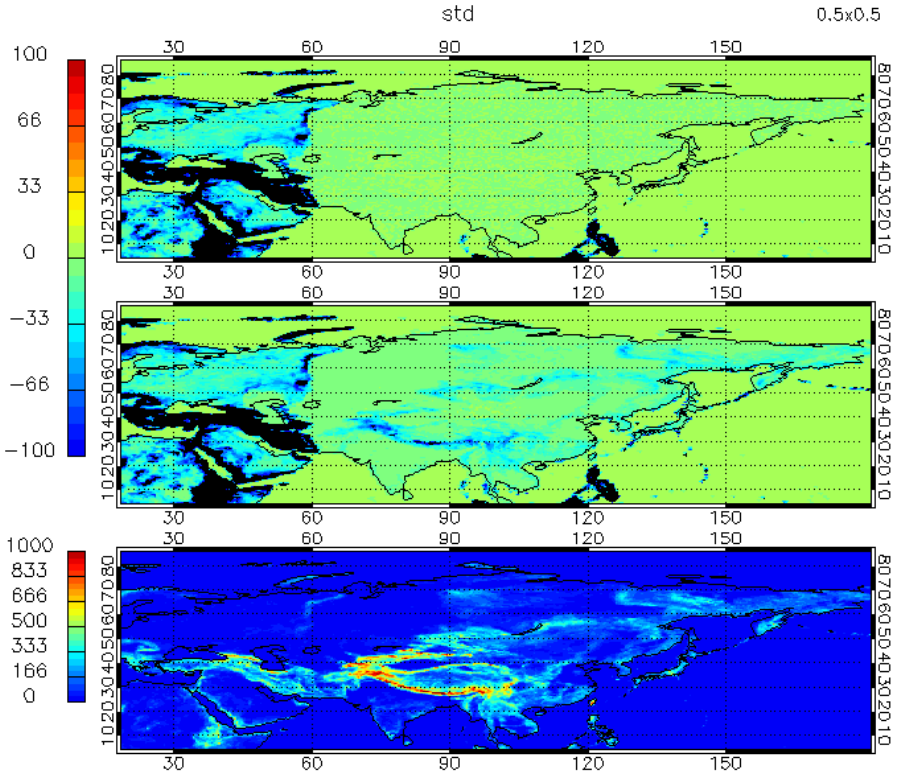
std_elev, 1km vs 3km

Comparing 1km to 3km std_elev

std_elev



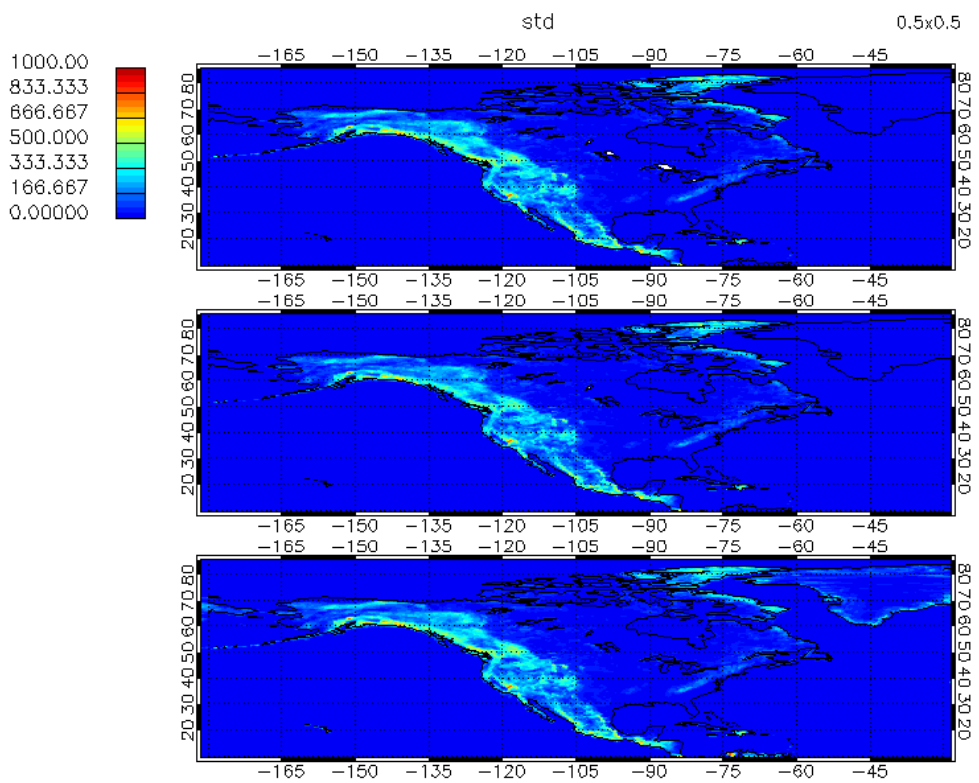
Difference std_elev



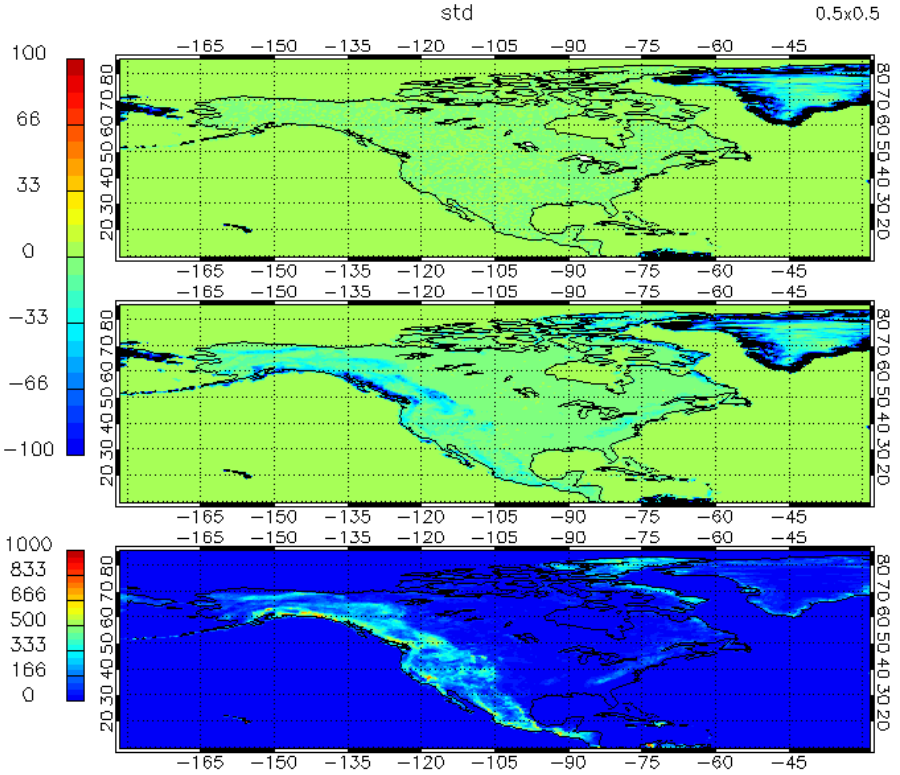
Top: my offline calculation of std_elev from 1km
Middle: my offline calculation of std_elev from 3km
Bottom: from surface dataset

Comparing 1km to 3km std_elev

std_elev



Difference std_elev



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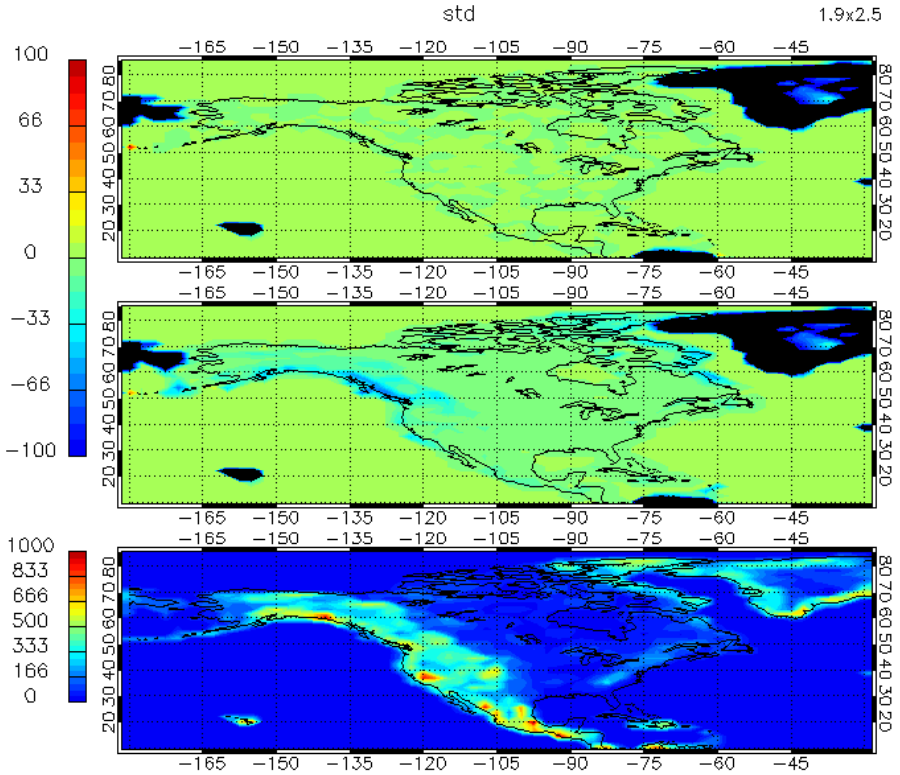
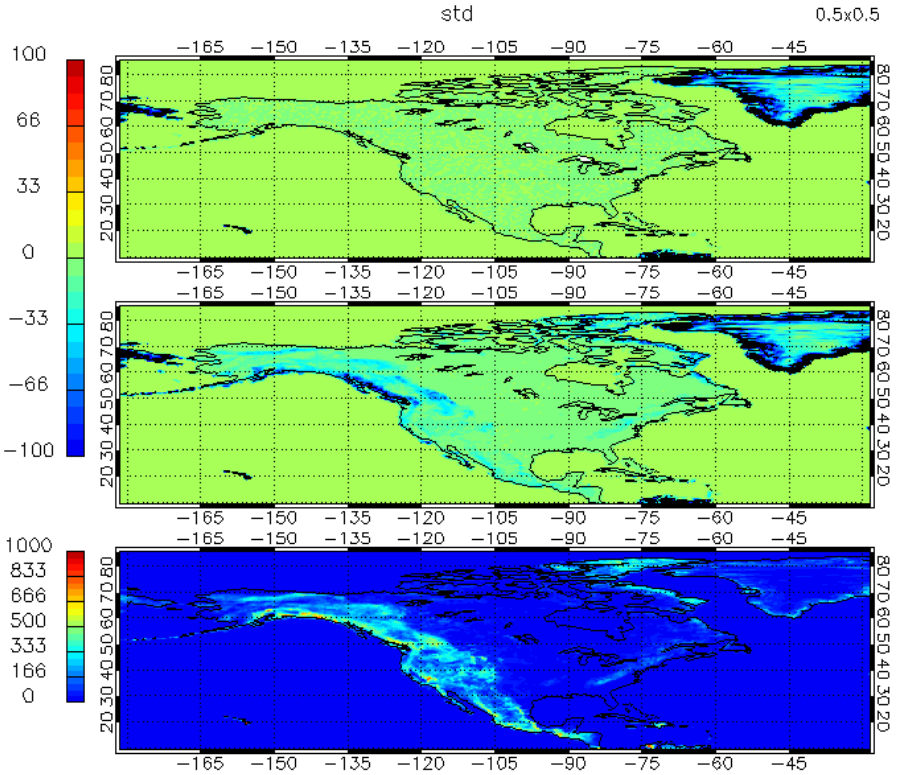
Comparing 1km to 3km std_elev

std_elev



Difference std_elev

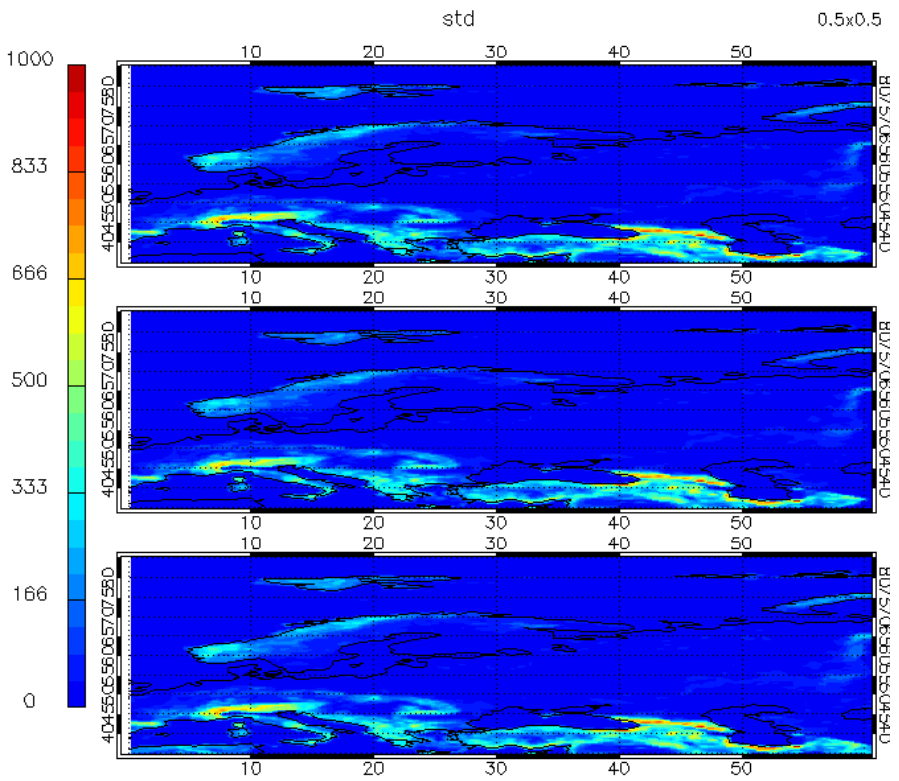


Left: 1.9x2.5

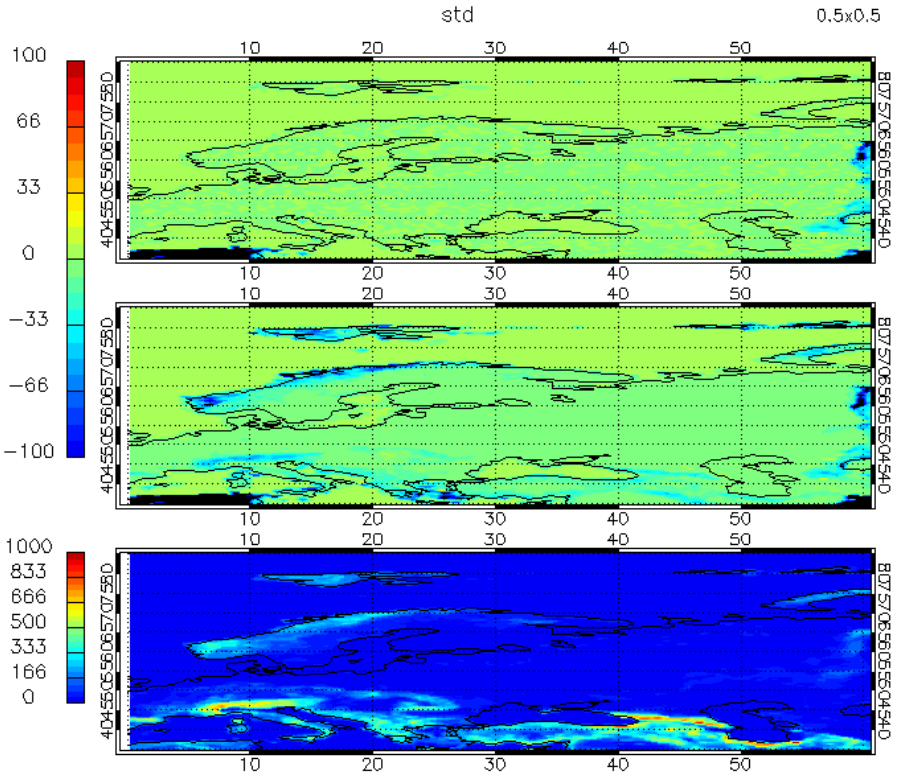
Right: 0.5x0.5

Comparing 1km to 3km std_elev

std_elev



Difference std_elev



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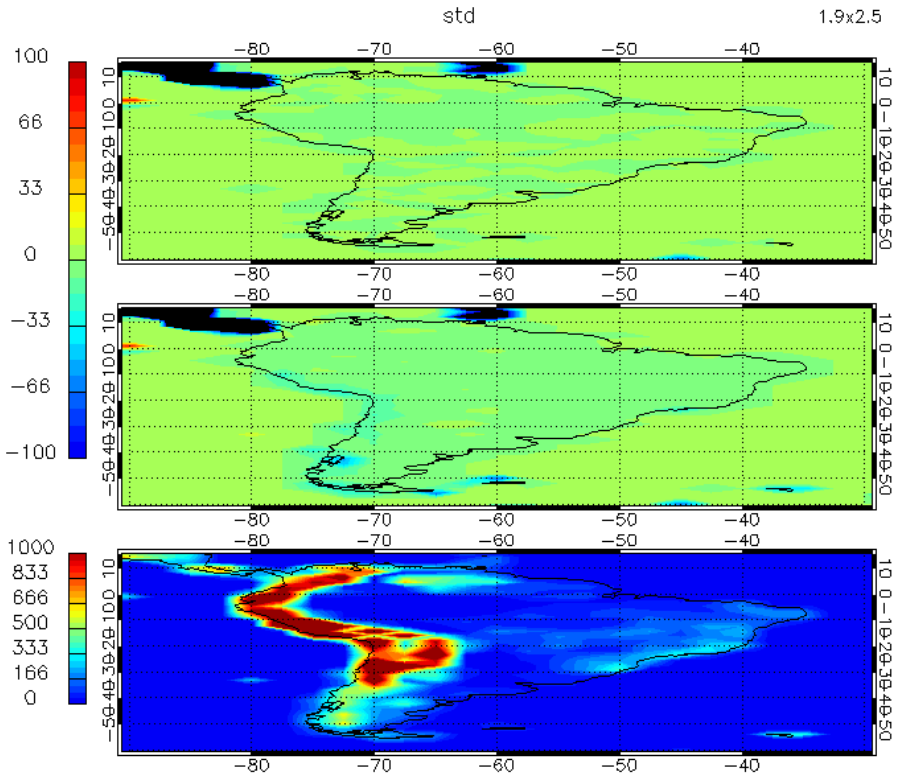
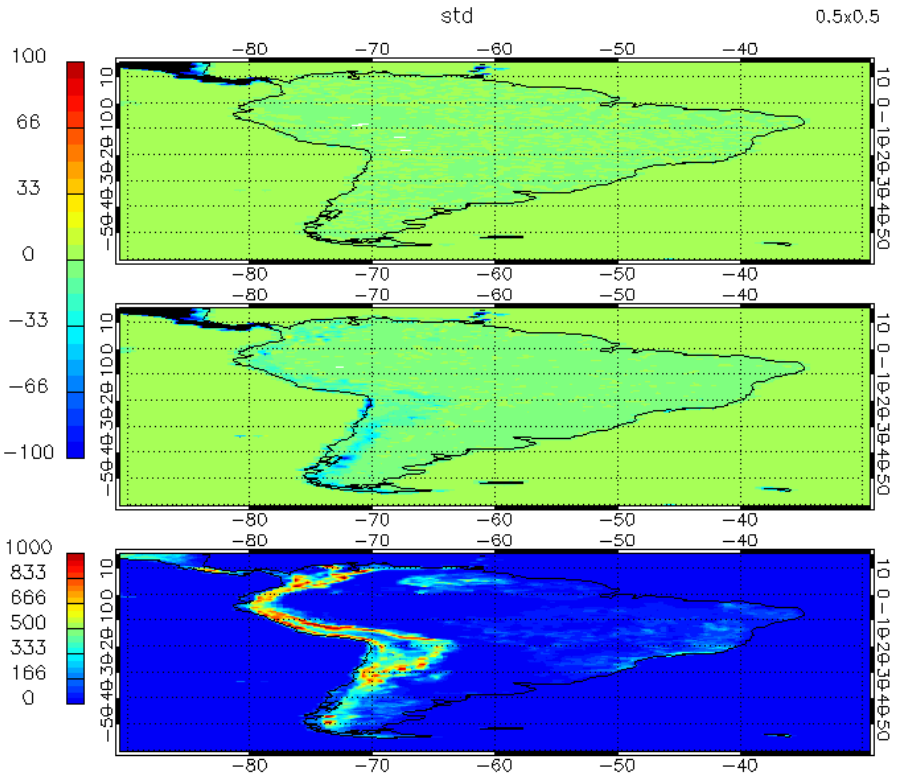
Comparing 1km to 3km std_elev

std_elev



Difference std_elev



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Summary

It looks like 3km or 5km will give reasonable values of std_elev for coarser resolutions, but might be quite different for higher resolution surface data files, e.g. 0.5 degree.

The main differences are in mountainous regions, which is also where the largest absolute values are.