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Abstract

We present an updated high resolution Early Eocene paleobathymetry (~55 Ma) with tectonic plate rotations. The high resolution of this dataset allows for resolving regional Eocene oceanographic processes, tidal dissipation, and global scale ocean flow. This dataset represents the latest global Eocene topography and paleobathymetry, is freely available, and aims to encourage consistency between different groups modelling various aspects of the Eocene Earth system.

Methods

- Paleobathymetry includes reconstructed sediment depths and large igneous provinces that are derived from Müller et al. (2008).
- Our Eocene paleotopography is taken from work by Paul Markwick (2007) which has been re-rotated using the same plate rotation model as our paleobathymetry.
- Improvement over previous Eocene paleotopographies is the treatment of Antarctica, which is now adapted from the ANTscape project (Wilson et al., 2012) and reflects significantly more elevated bedrock.

Discussion

- **Figure 1:** The paleobathymetry and topography reconstruction. We applied the Poisson function to fill in the basins and gaps between topography and bathymetry.
- **Figure 2:** Preliminary model results of surface temperature. Comparison of Sewall et al. (2000) paleo reconstruction and our new bathymetry-topography. Both simulations are fully coupled 2x2 degree resolution at 2240 ppmv CO₂.
- **Figure 3:** Significant differences between modern and the Eocene tidal dissipation (Green and Huber, 2013) is shown. River transport, plant functional type distribution, aerosols, etc., are also provided with our dataset.

Bathymetry and Topography

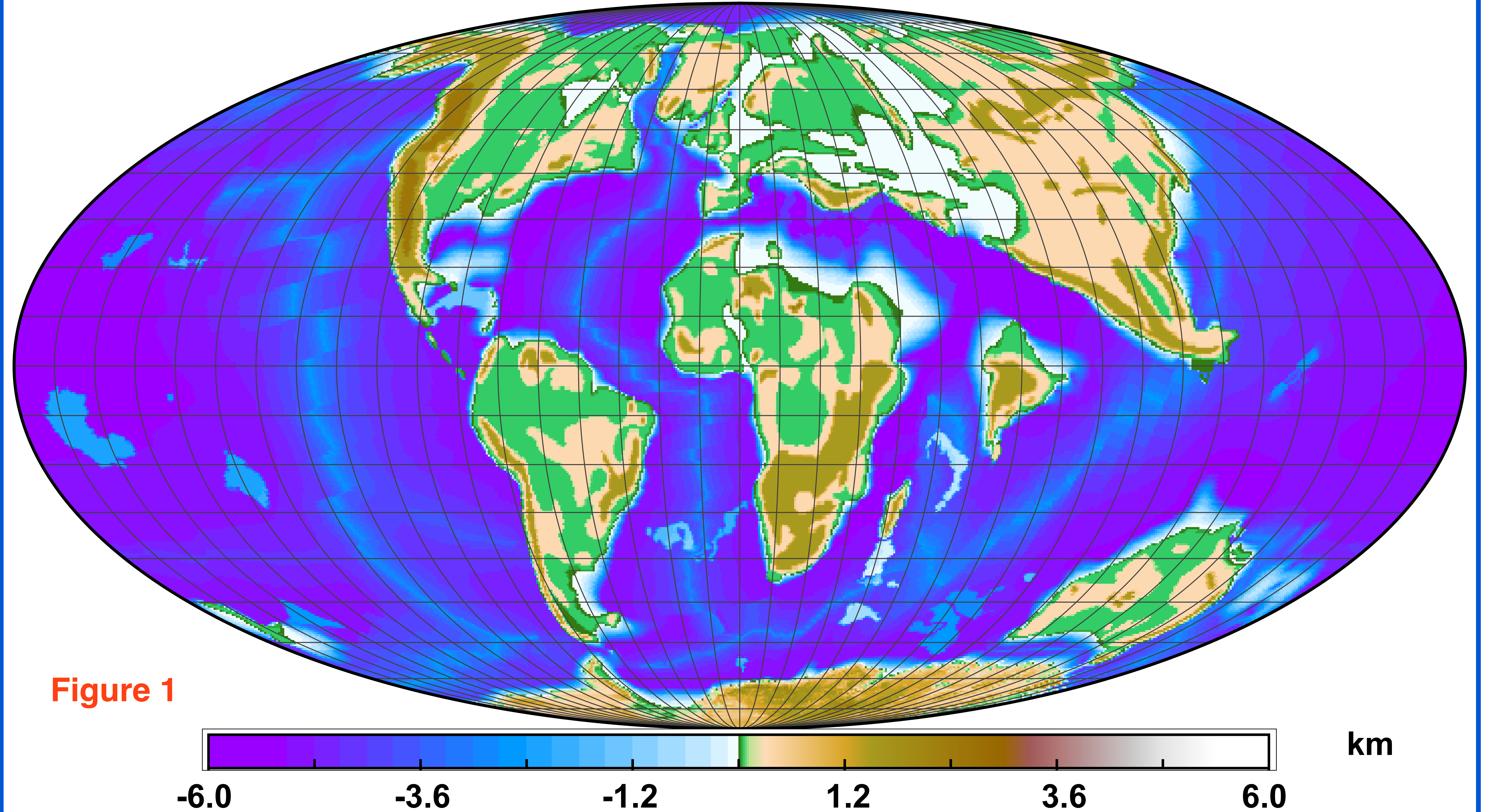
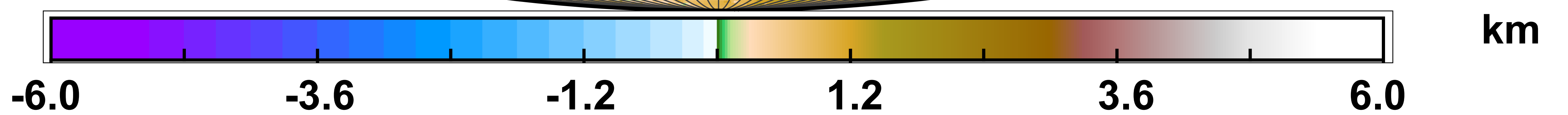


Figure 1

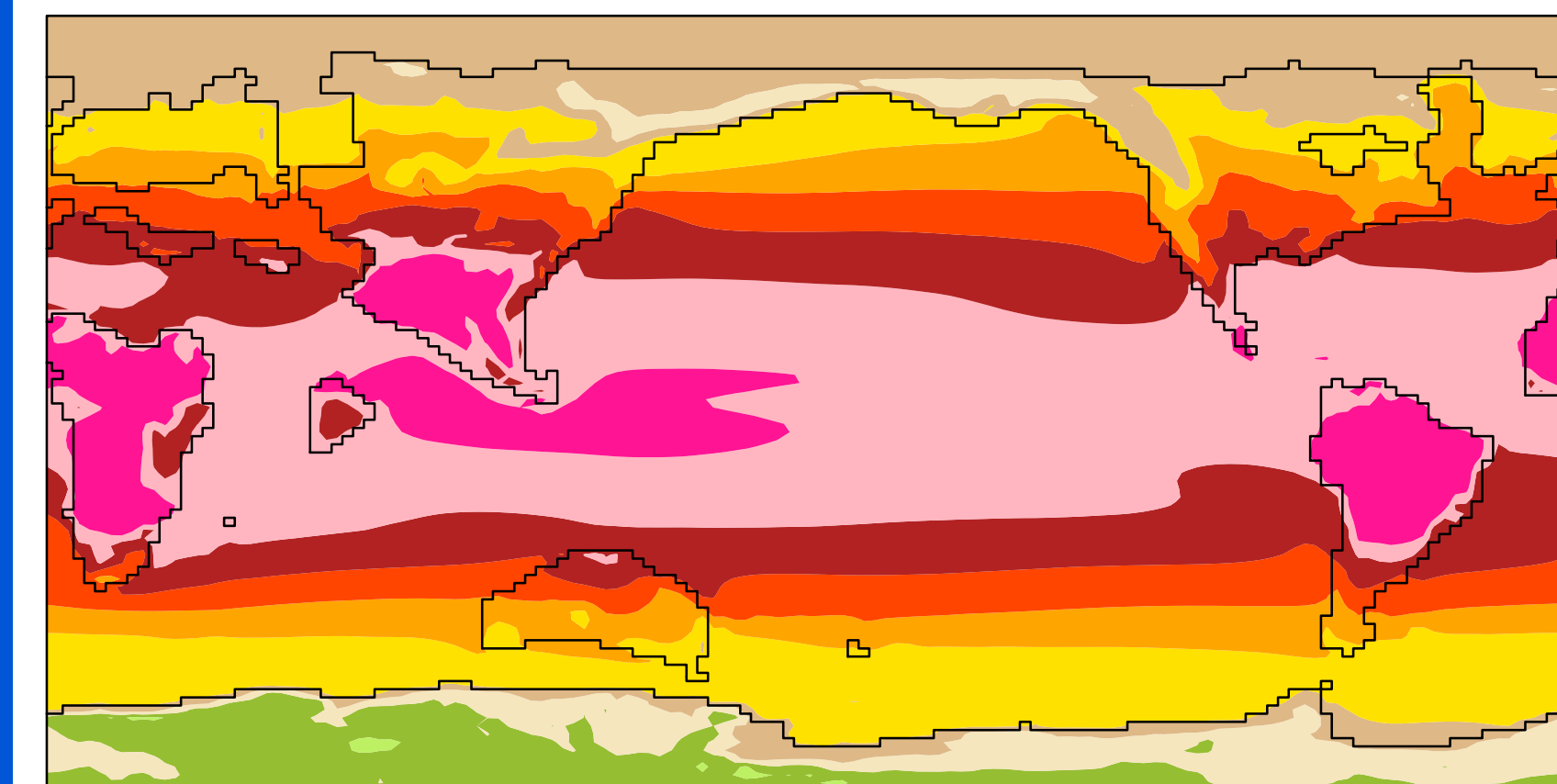


Surface Temperature

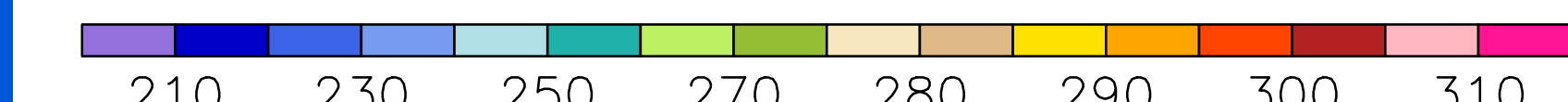
Our Reconstruction

B.EO_3_C4f19g16_conte_105 (yrs 410-439)

Surf Temp (radiative) mean = 300.95



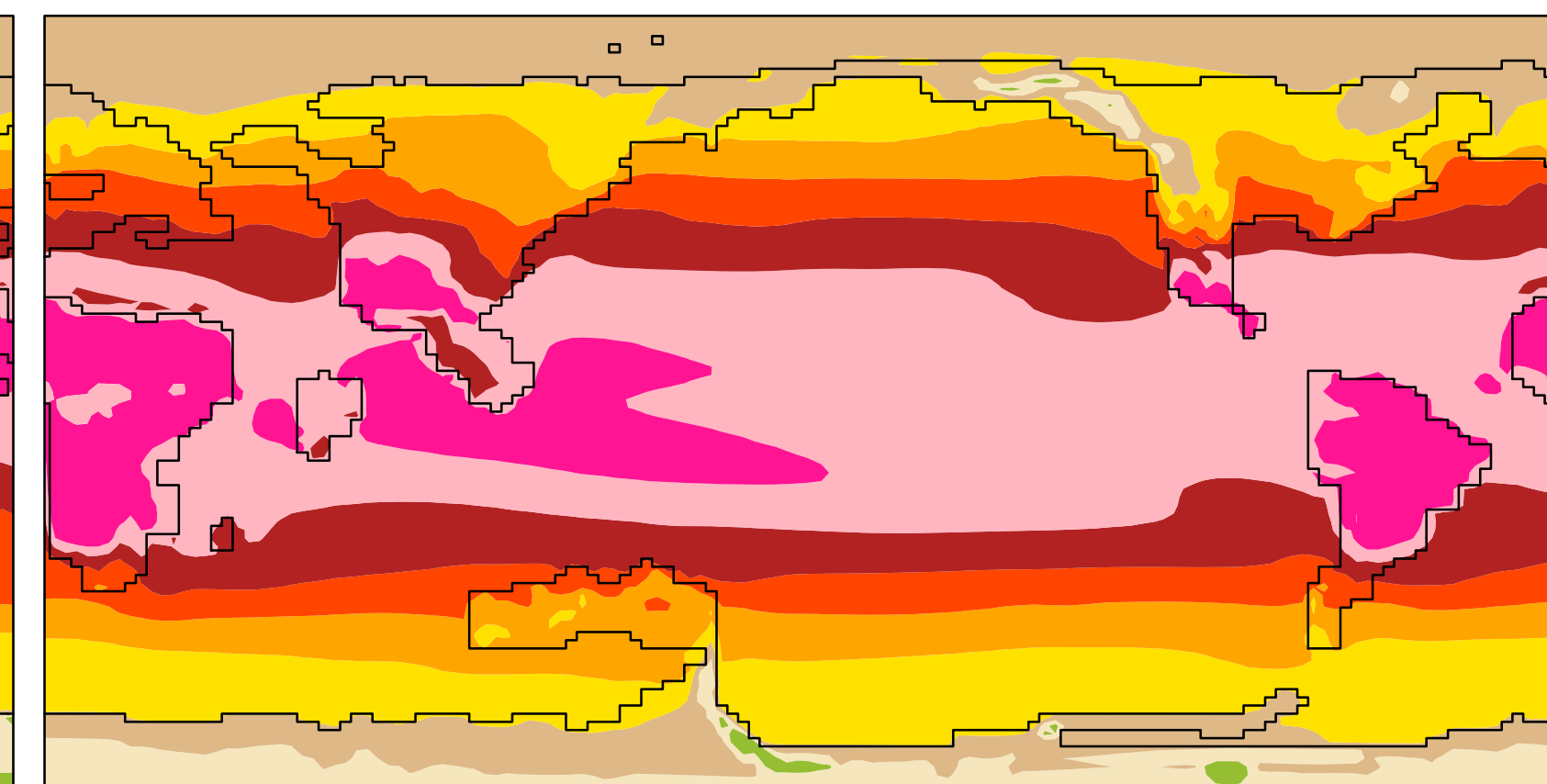
Min = 267.49 Max = 324.36



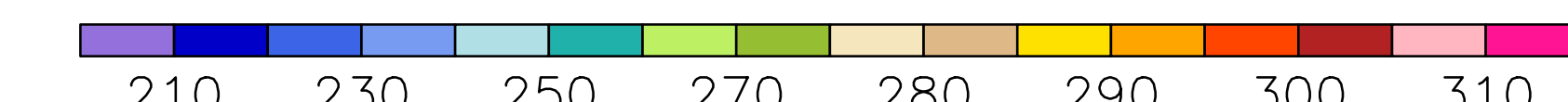
Sewall et al., 2000

B.EO_3_C4x2 (yrs 2960-2989)

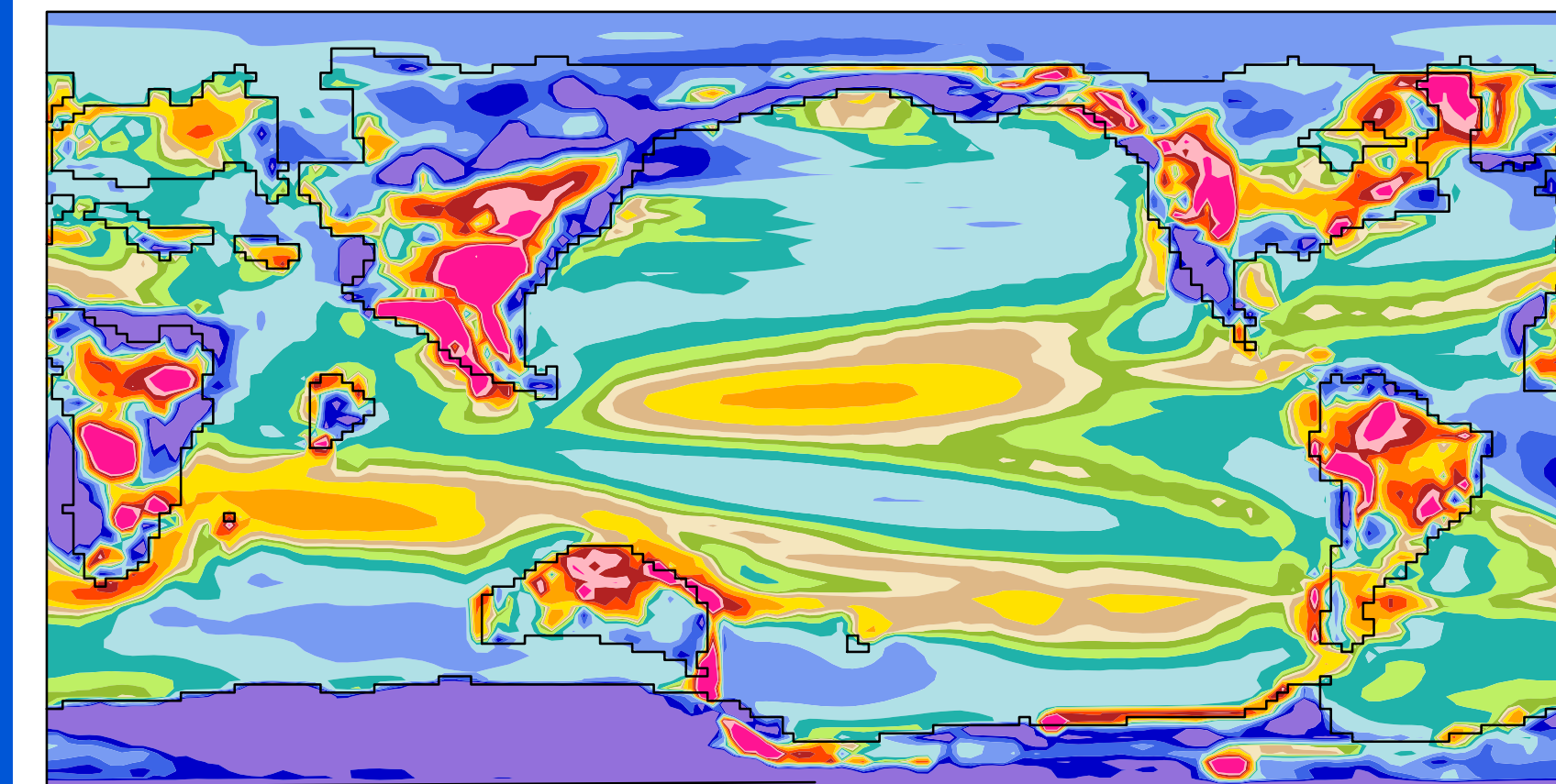
κ Surf Temp (radiative) mean = 301.70



Min = 270.02 Max = 320.93



B.EO_3_C4f19g16_conte_105 - B.EO_3_C4x2
mean = -0.75 rmse = 2.72



Min = -16.86 Max = 16.39



T-test of the two means at each grid point
Colored cells are significant at the 0.05 level

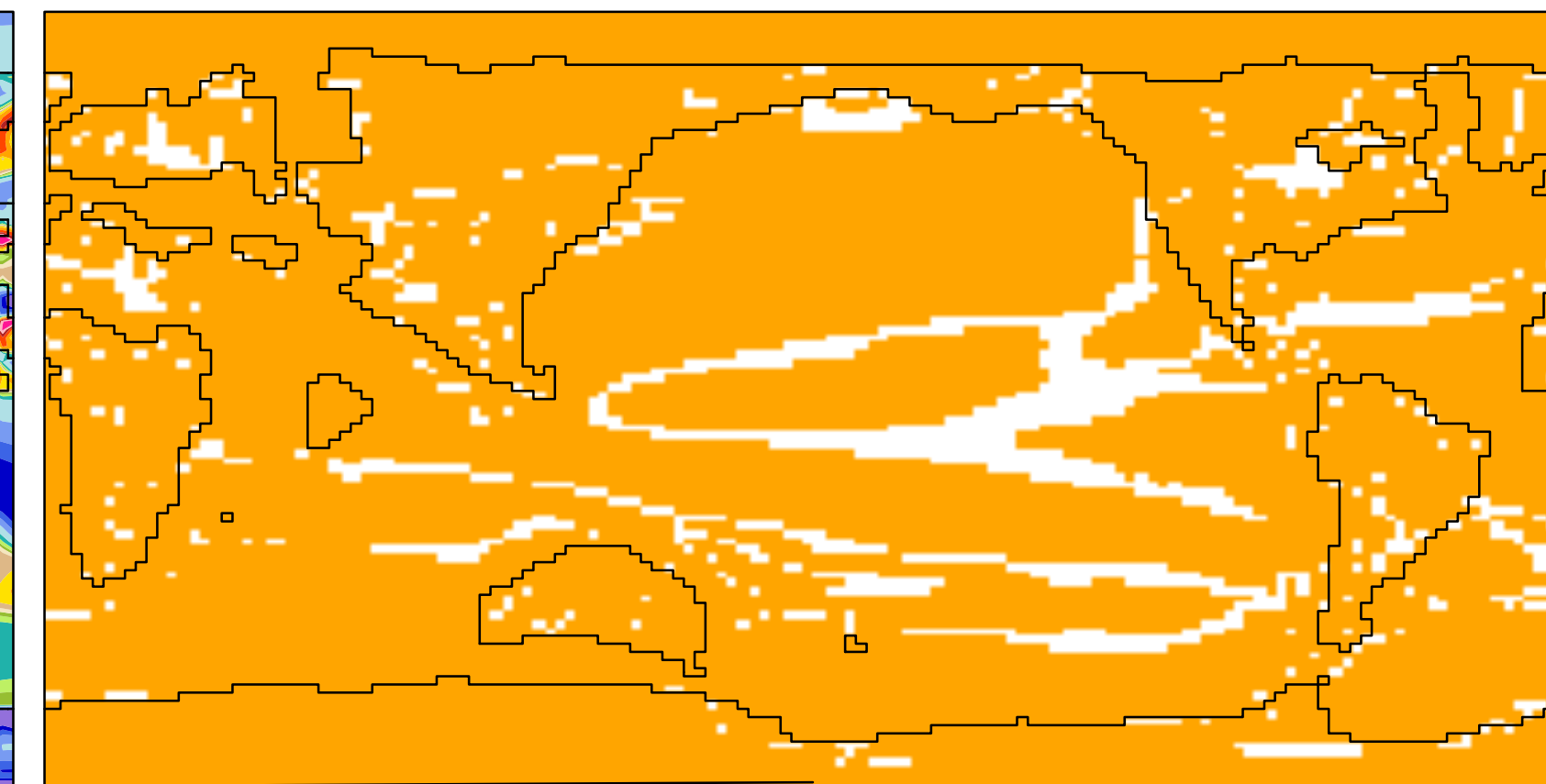
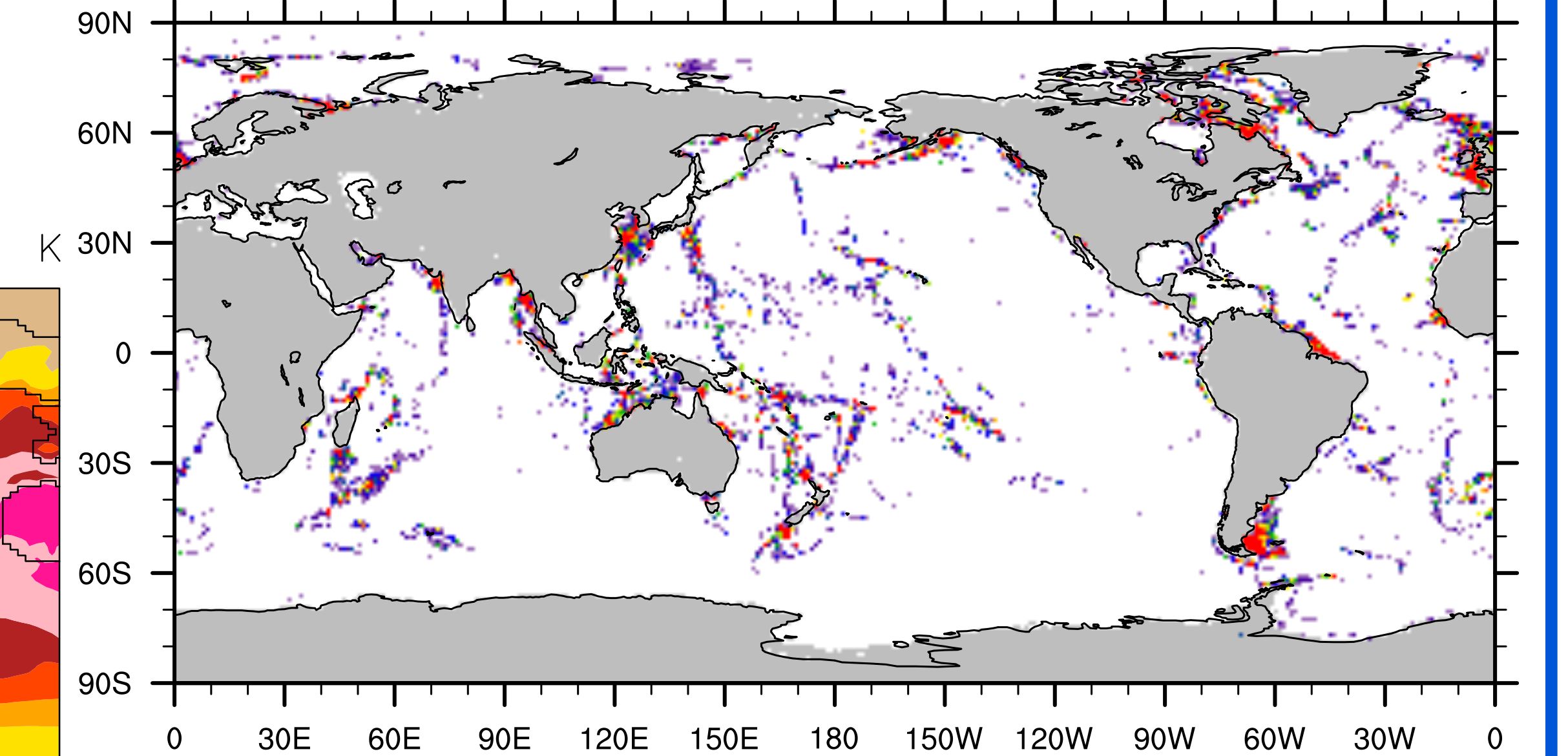


Figure 2

Tidal Dissipation

a) Modern tidal dissipation



b) Eocene tidal dissipation

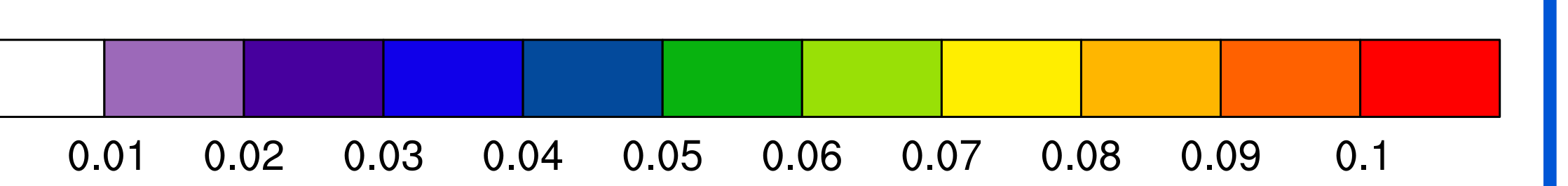
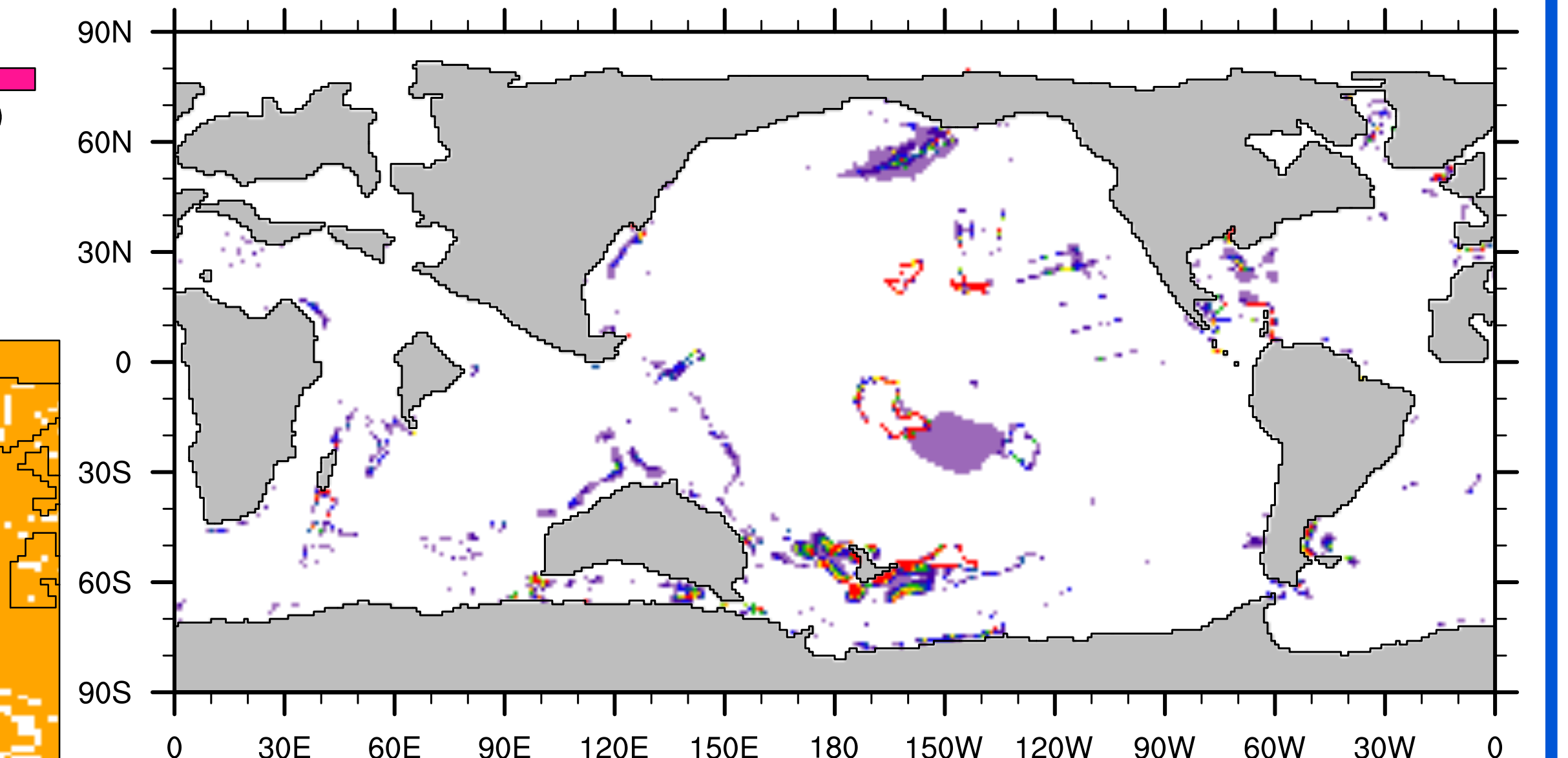


Figure 3

Future Work

- Apply reconstruction techniques to additional time slices (e.g. Eocene-Oligocene transition, etc.).
- Open access journal discussion: www.geosci-model-dev-discuss.net/7/529/2014/ doi:10.5194/gmdd-7-529-2014

References

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