

## **Diagnostics for Atlantic Water circulation and properties**

Elizabeth Hunke, Mat Maltrud, Michael Karcher & me



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horiz & vertical sections    T, S, veloc, ..    times & locations



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(> 600 months) \* (several depths or sections) \* (3 or more fields) =  $O(10^4)$  pictures

\* several models =>  $O(10^5)$     @ few sec each =>  $O(10^6 \text{ sec}) = O(10^3 \text{ hours})$



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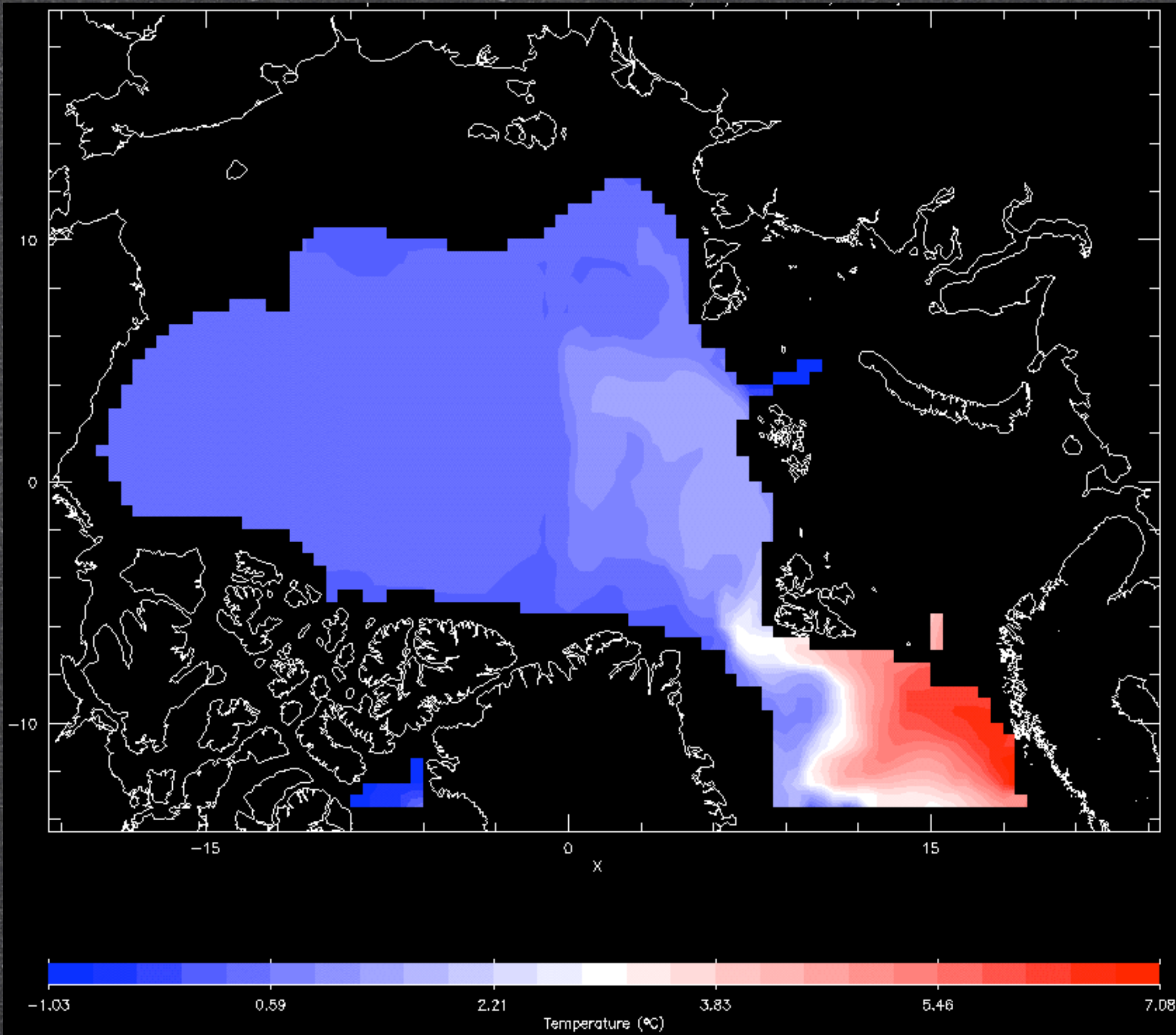
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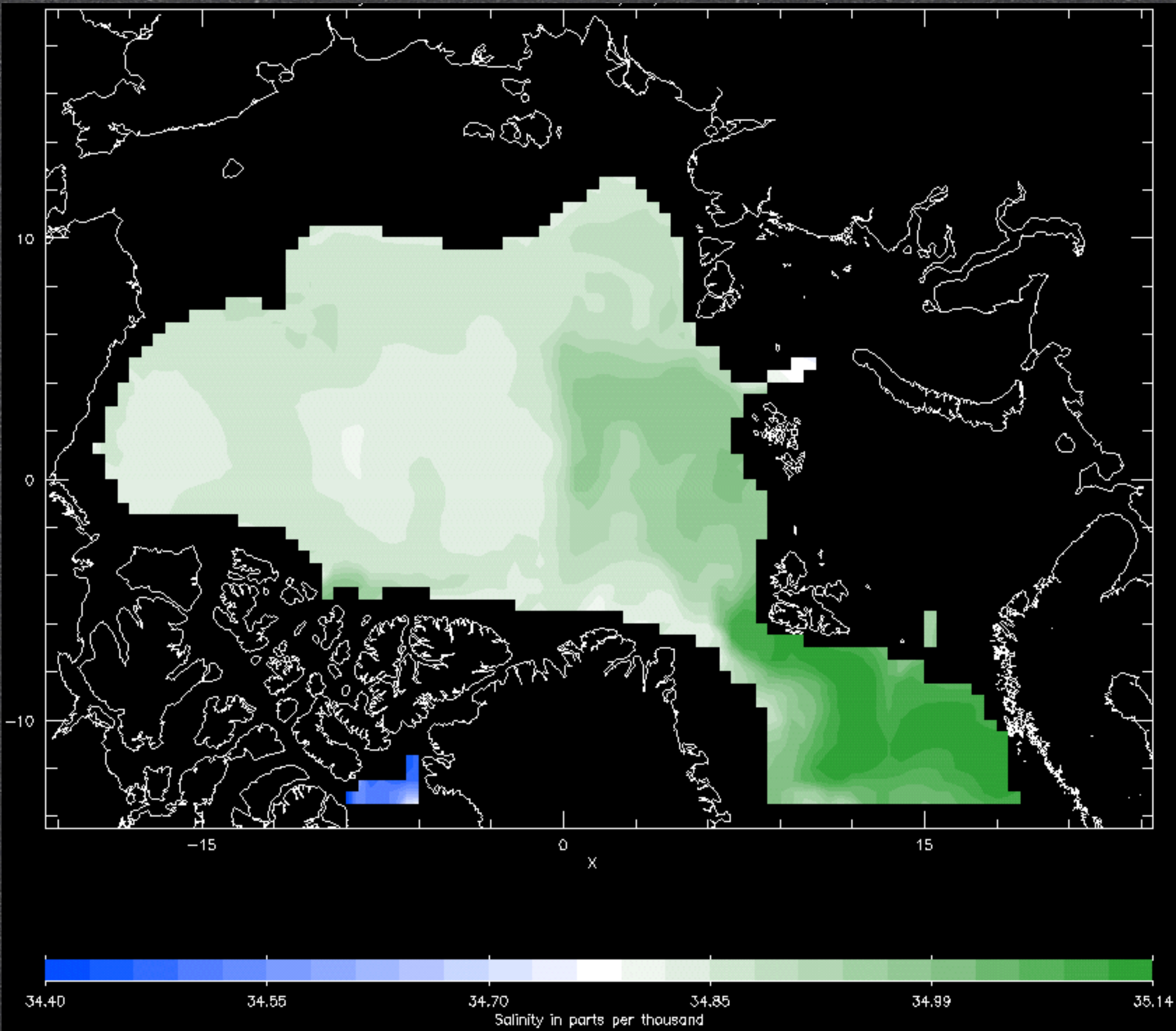
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For example: T, S, U at 400m, Dec 1984, IOS case X9b

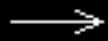
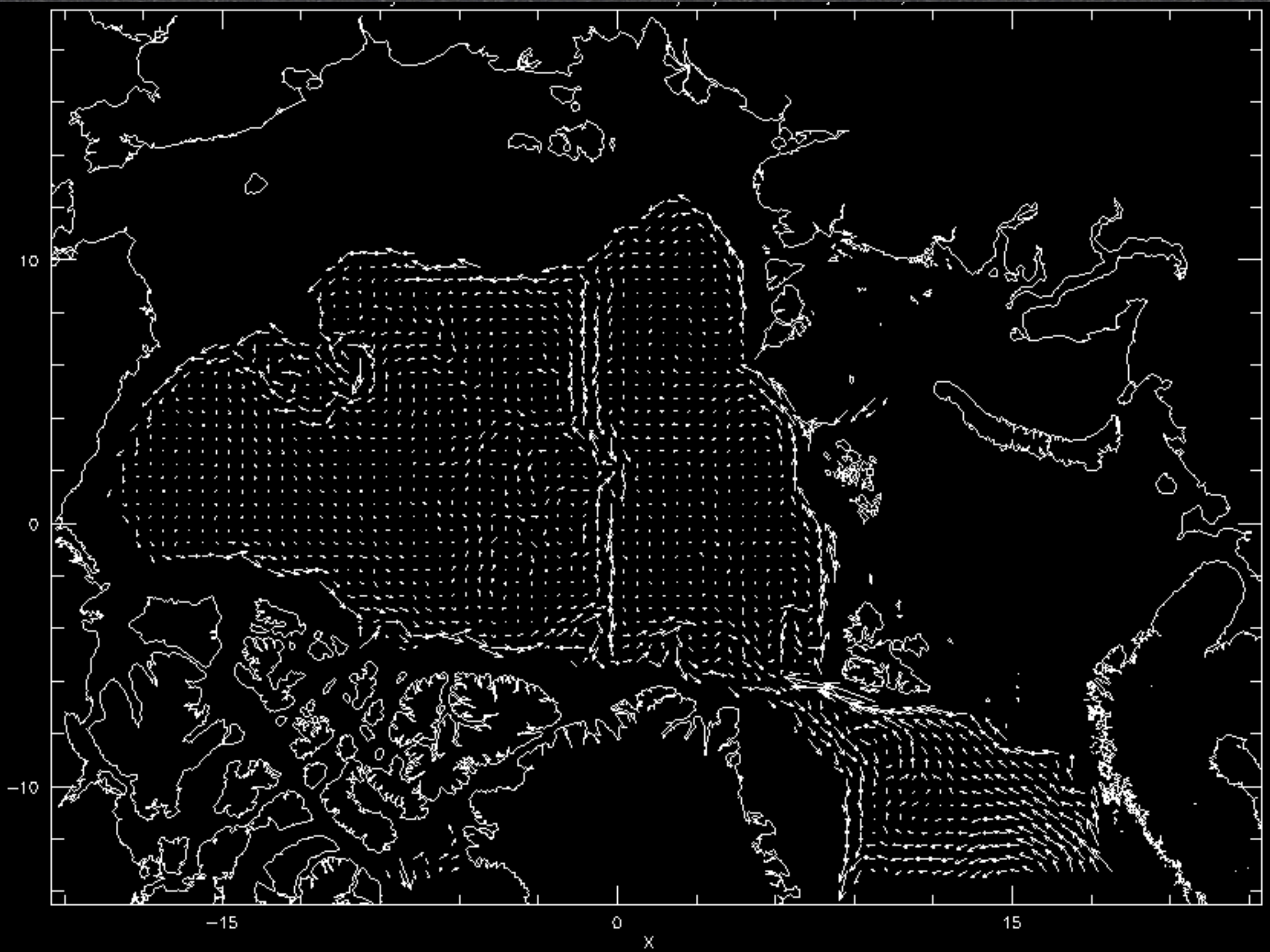












max 9.48 cm/sec



## What to do?

Reduce T & S maps to “average value”? Beware!

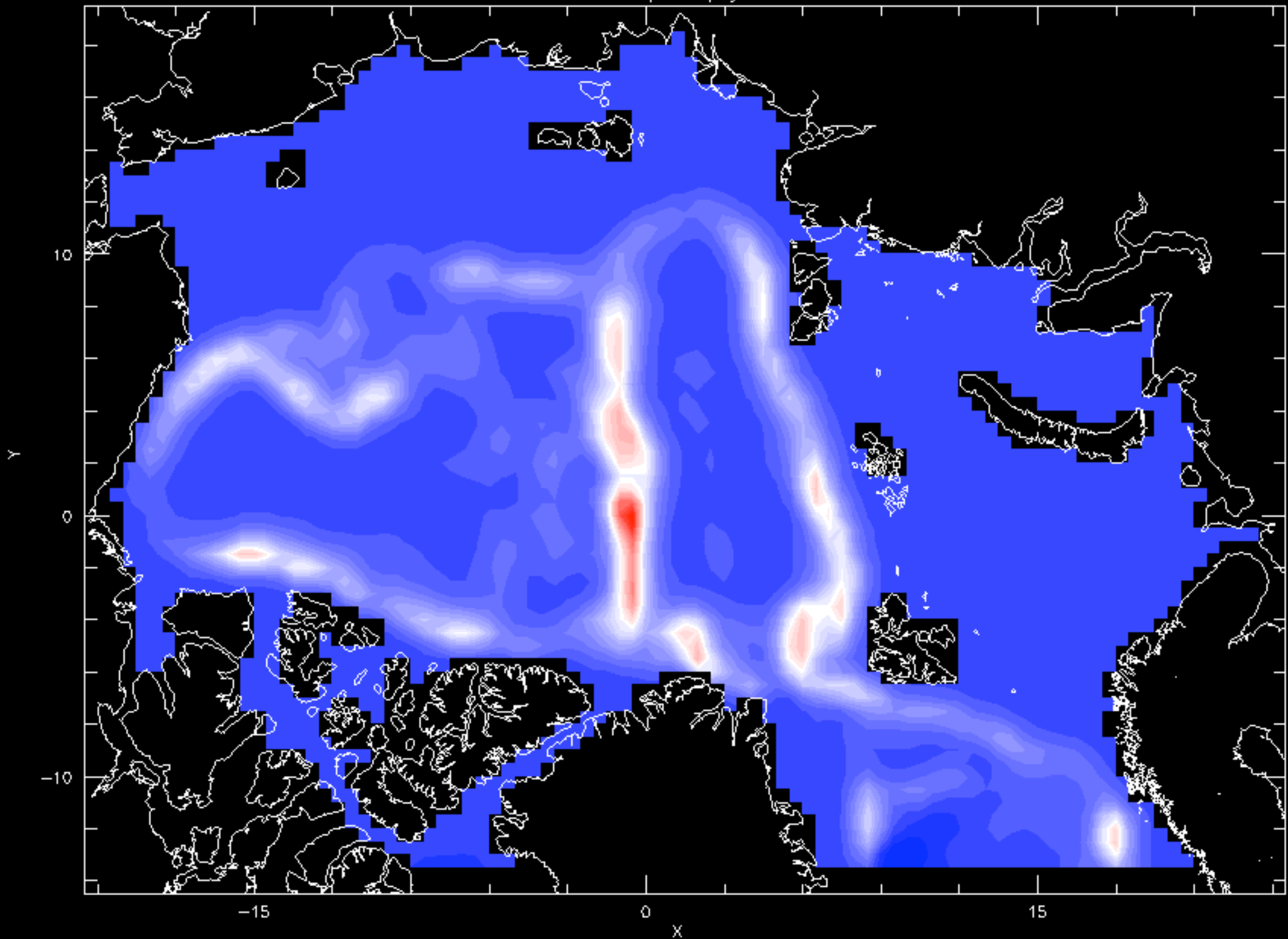
But how to simplify “circulation”?

Suggestion: topostrophy  $\tau = \mathbf{f} \times \mathbf{u} \cdot \nabla D$

or normalize (nondimensionalize):  $\frac{\tau}{|\mathbf{f}||\mathbf{u}||\nabla D|}$



topostrophy



$-9.20 \times 10^{-10}$

$1.02 \times 10^{-9}$

$2.96 \times 10^{-9}$

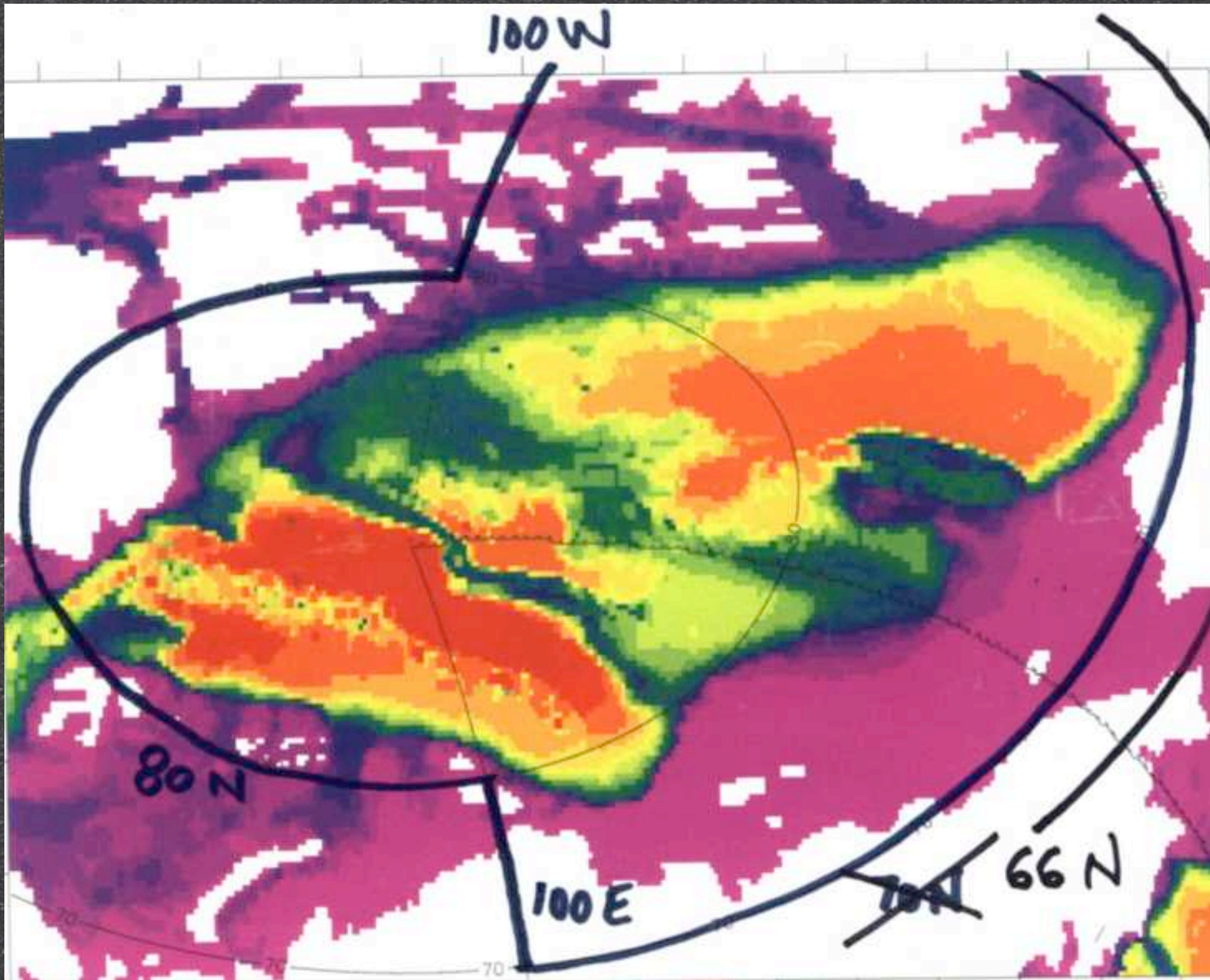
cm/sec

$4.90 \times 10^{-9}$

$6.83 \times 10^{-9}$

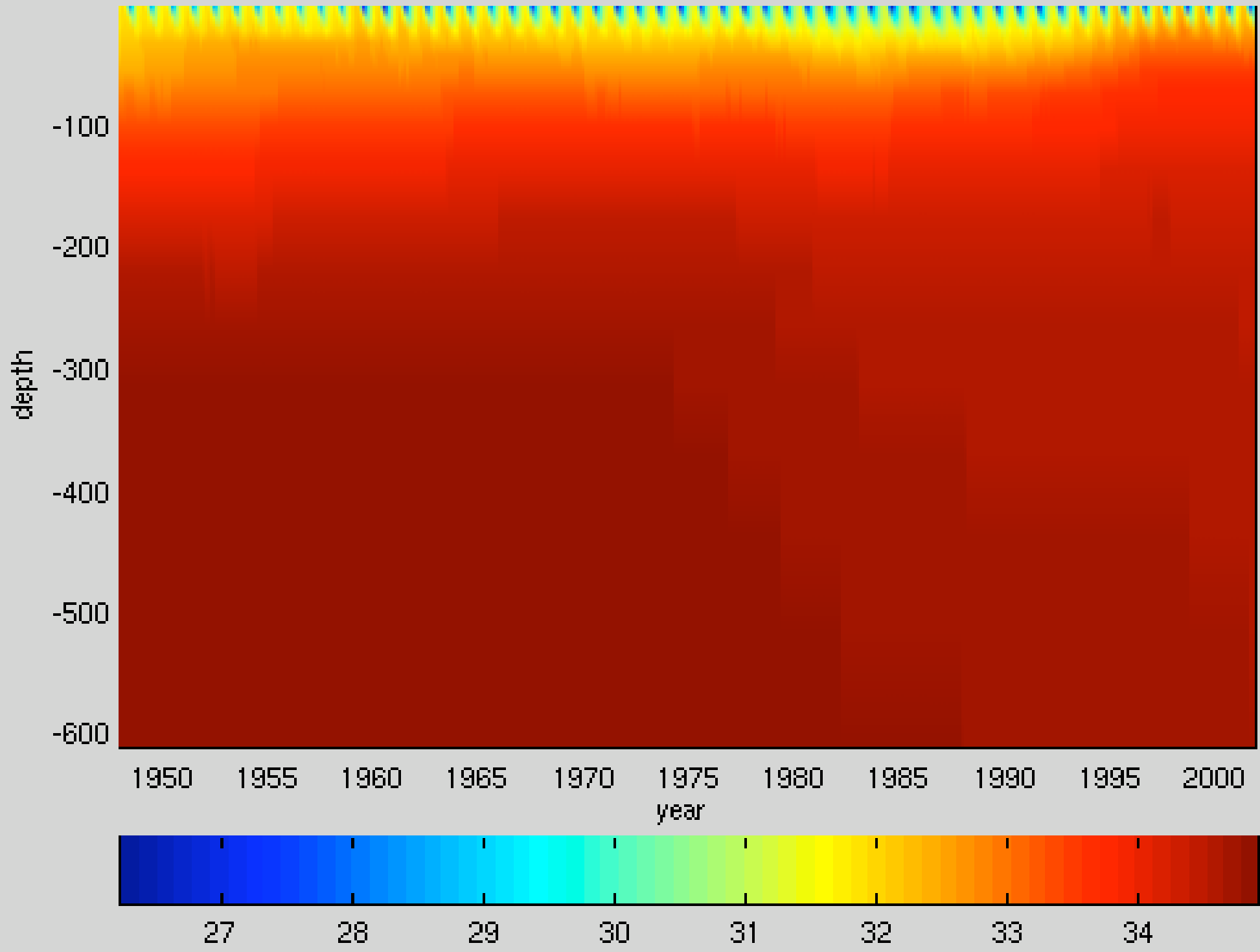
$8.77 \times 10^{-9}$





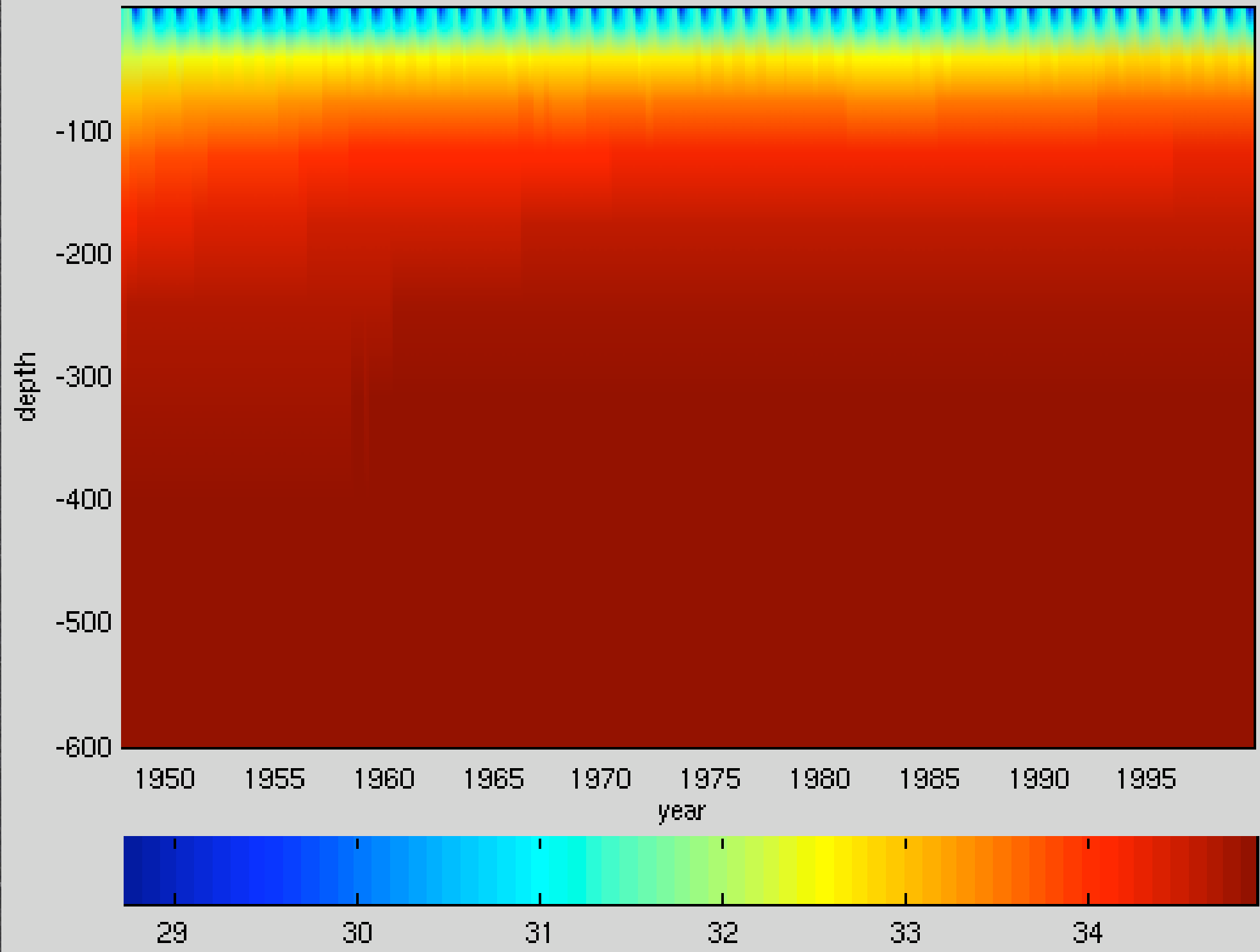


AWI salinity





IOS salinity

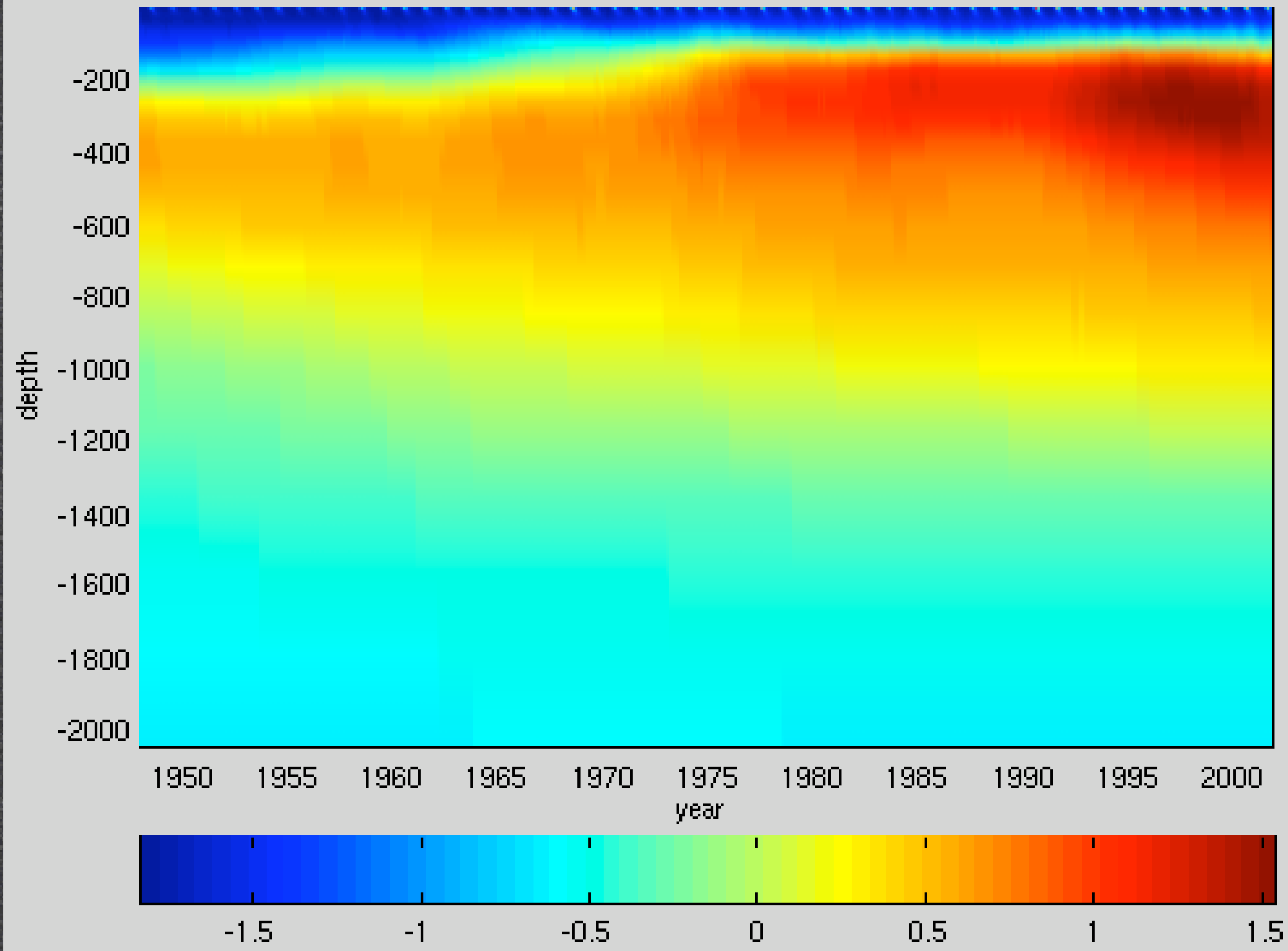






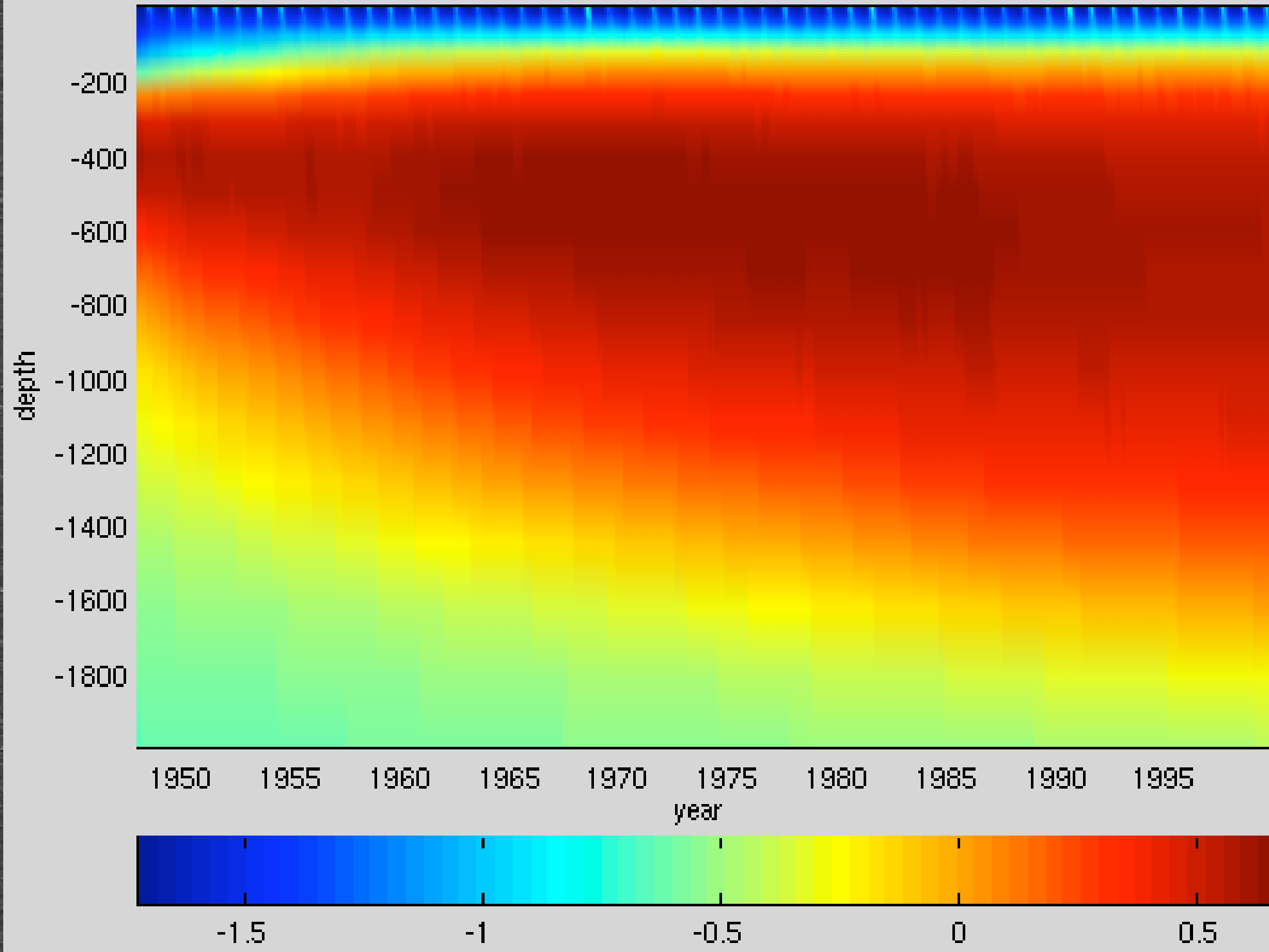


$\Delta$ WI temperature





IOS temperature

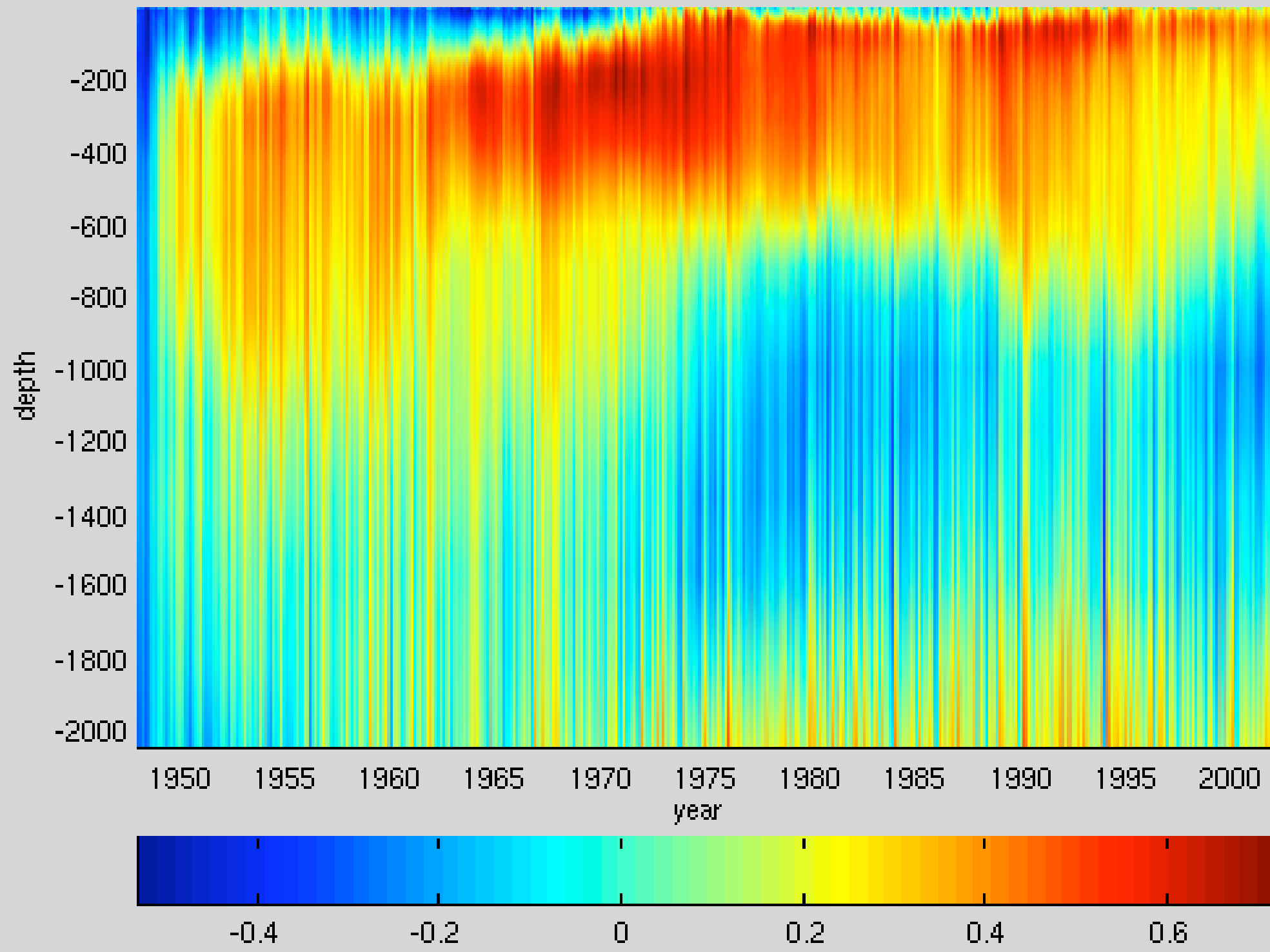






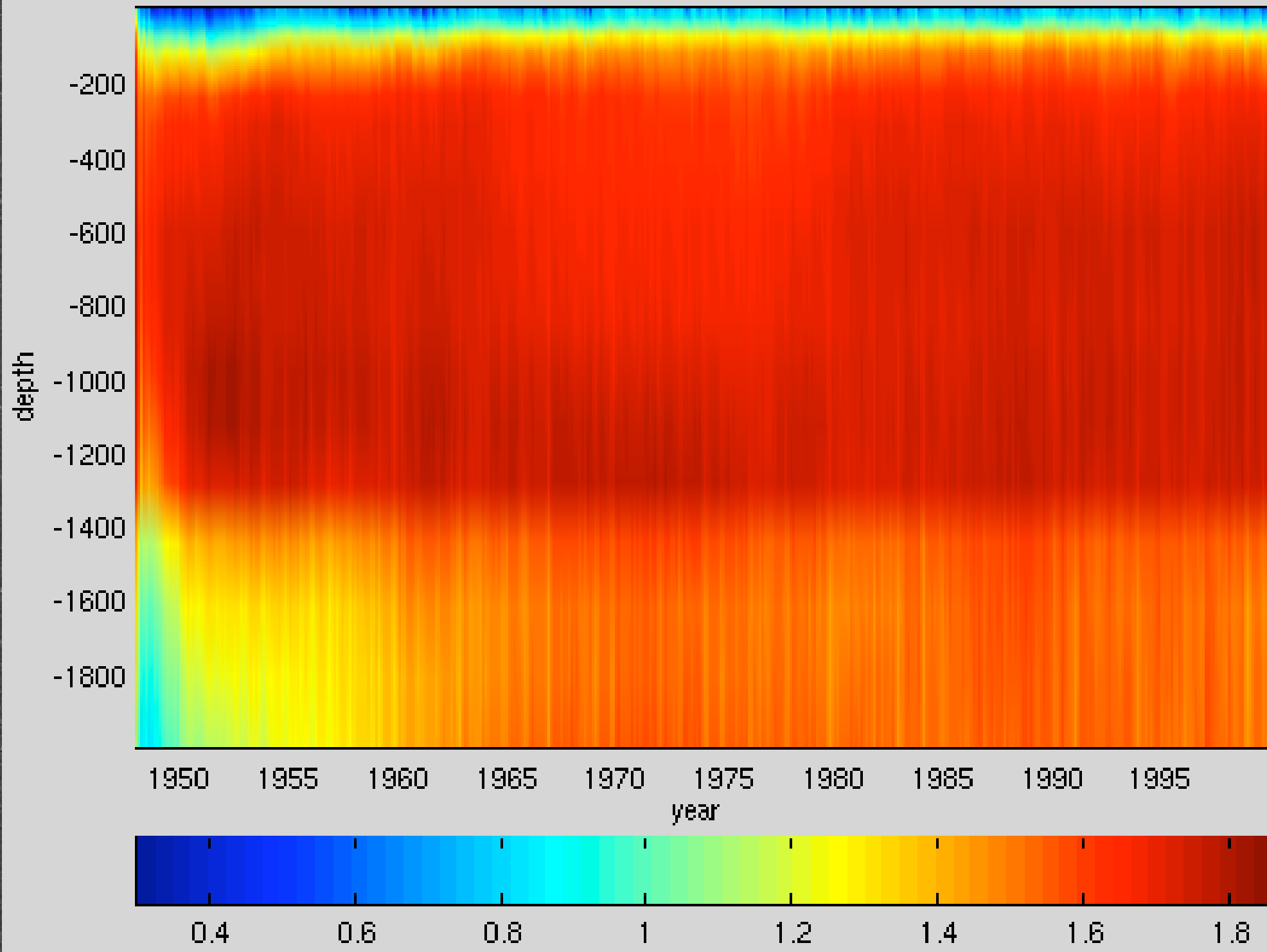


AWI topostrophy



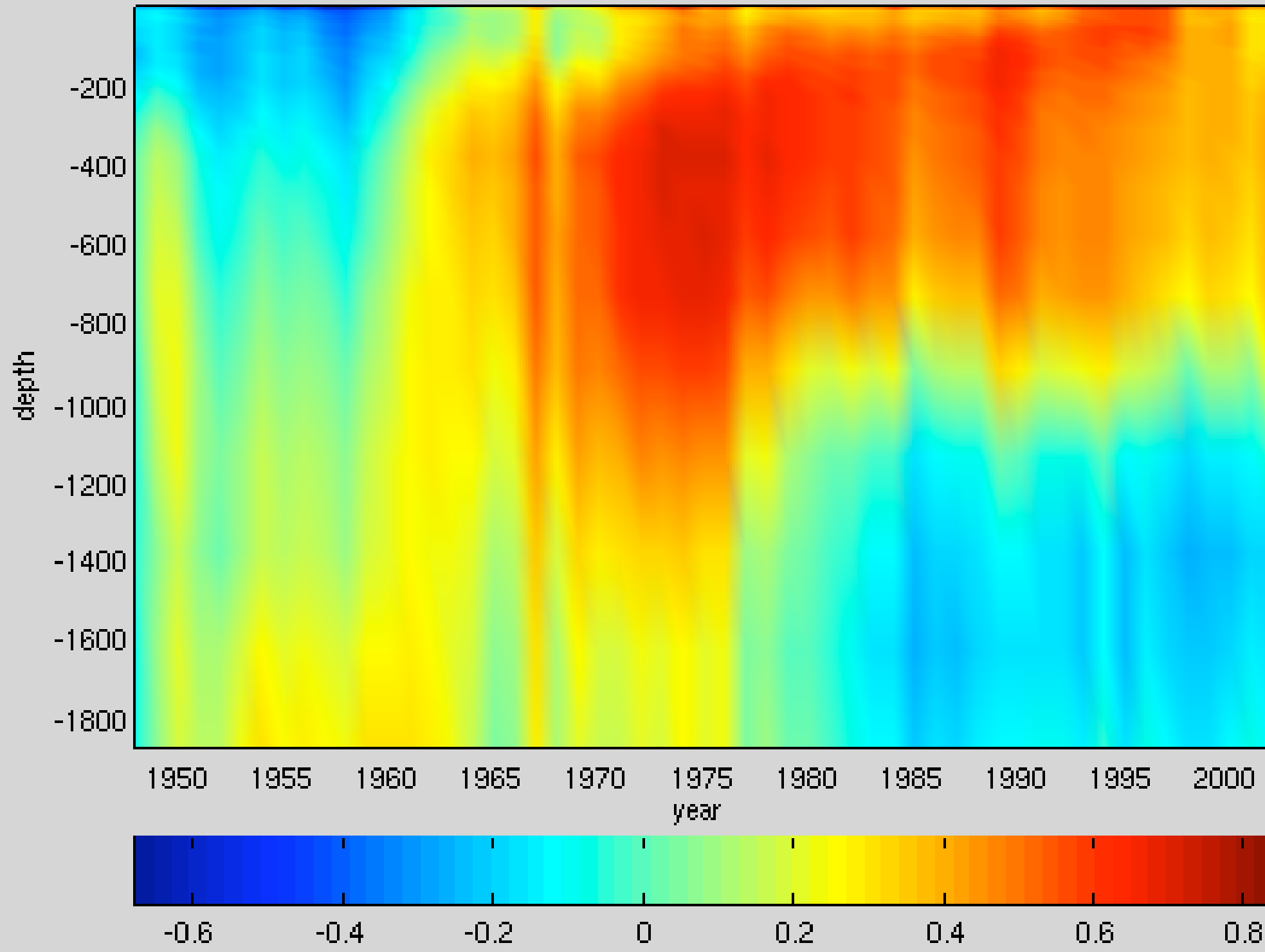


IOS topostrophy



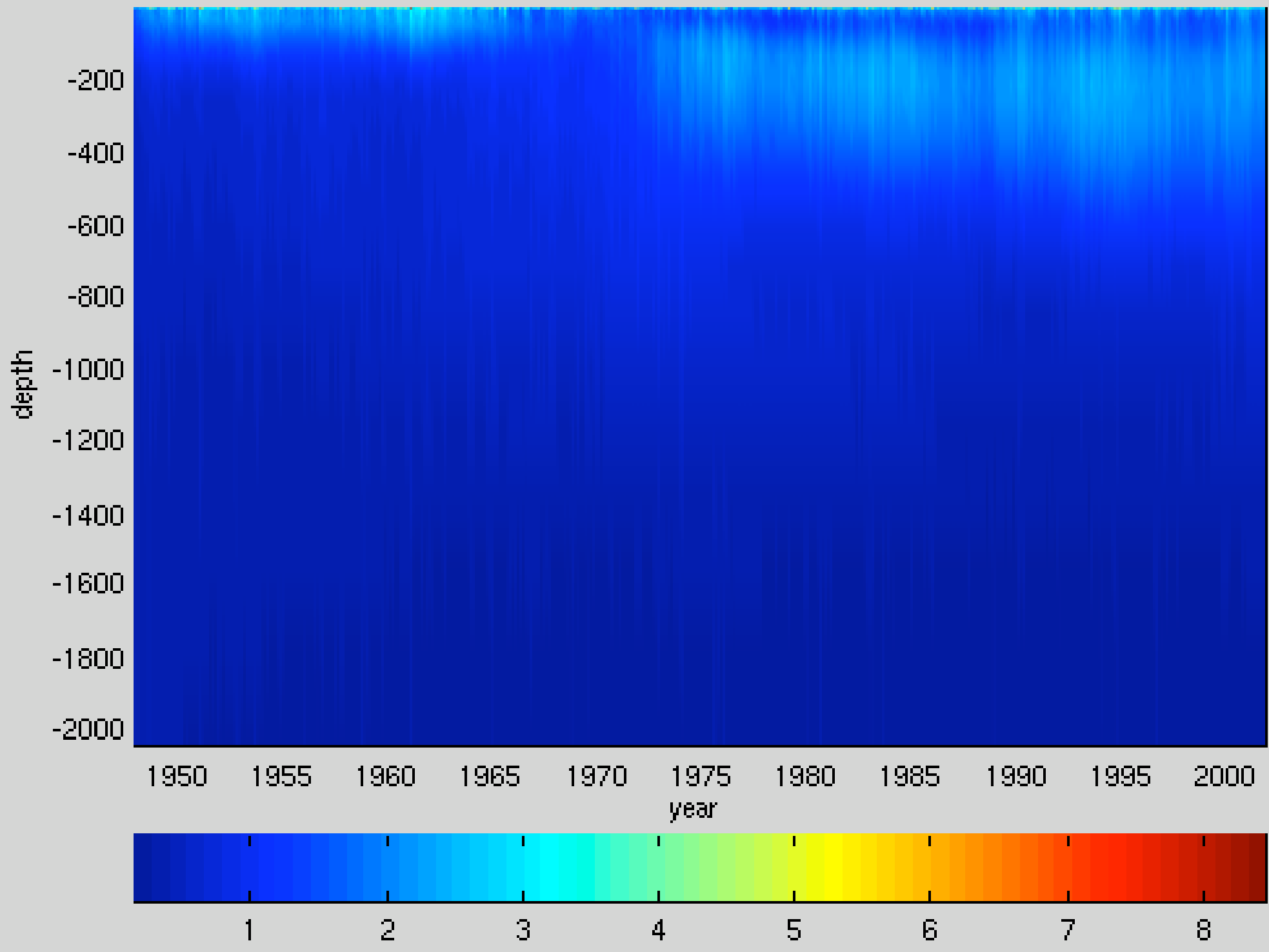


LANL topostrophy

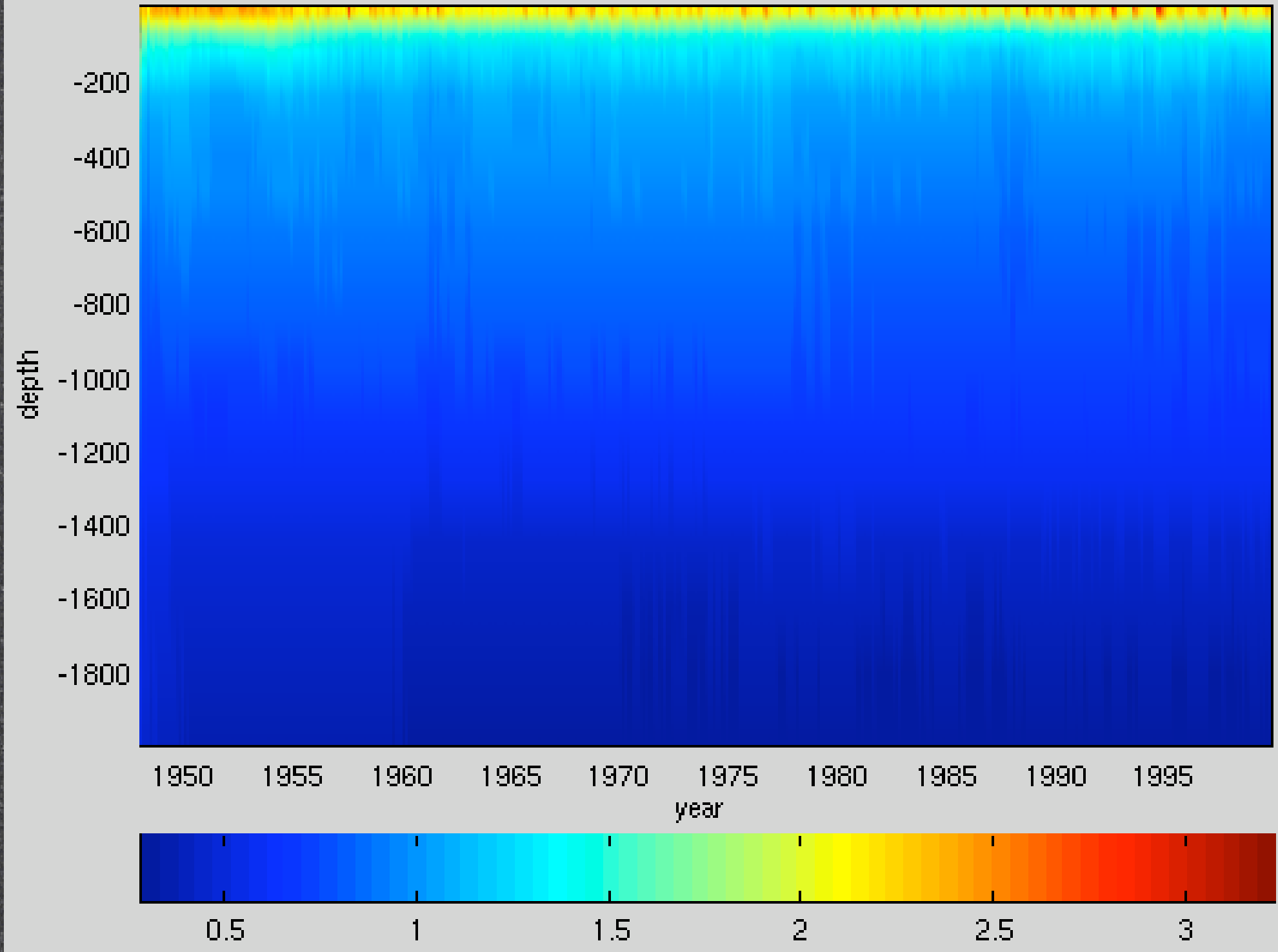




AWI speed

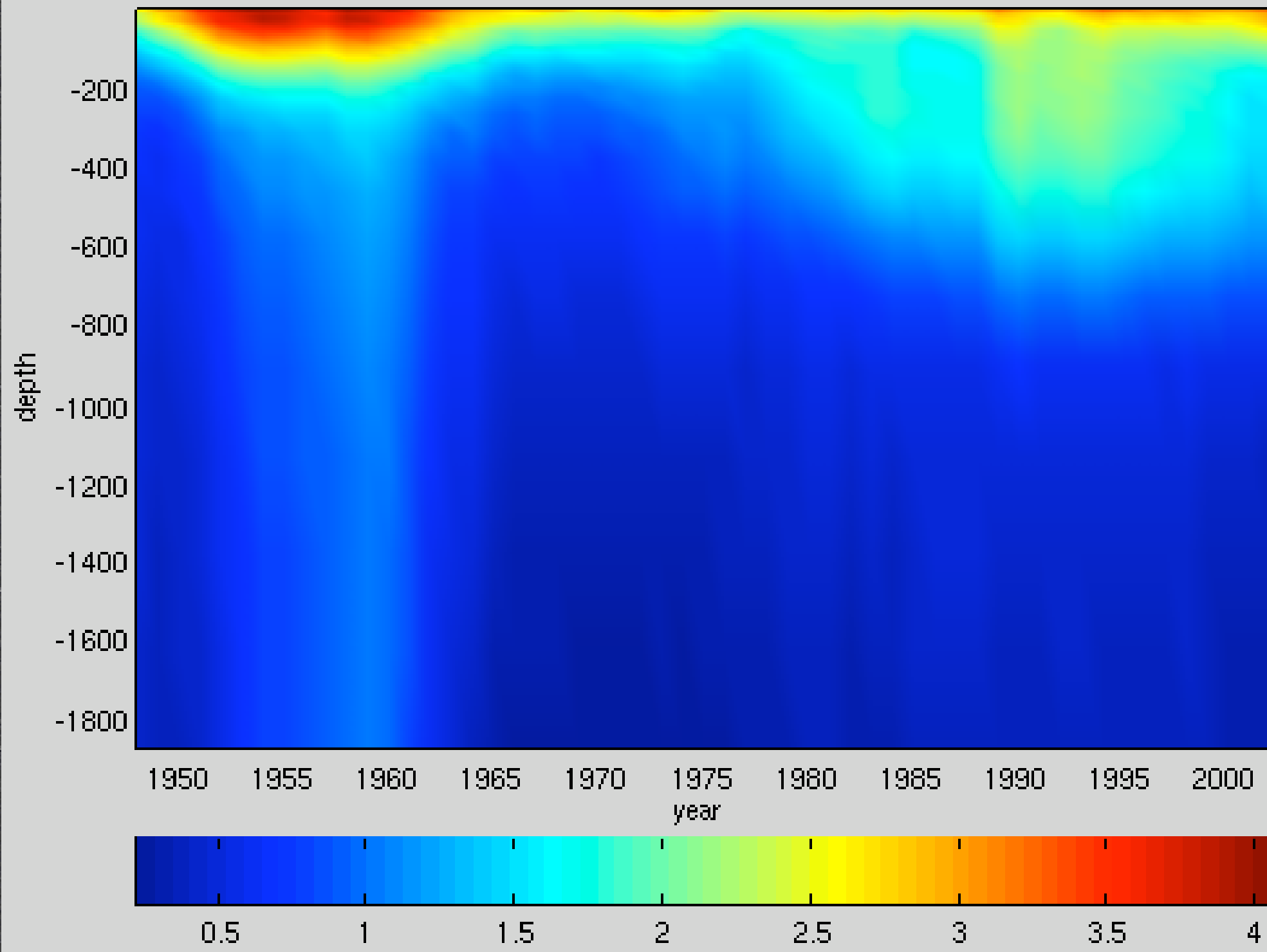


IOS speed





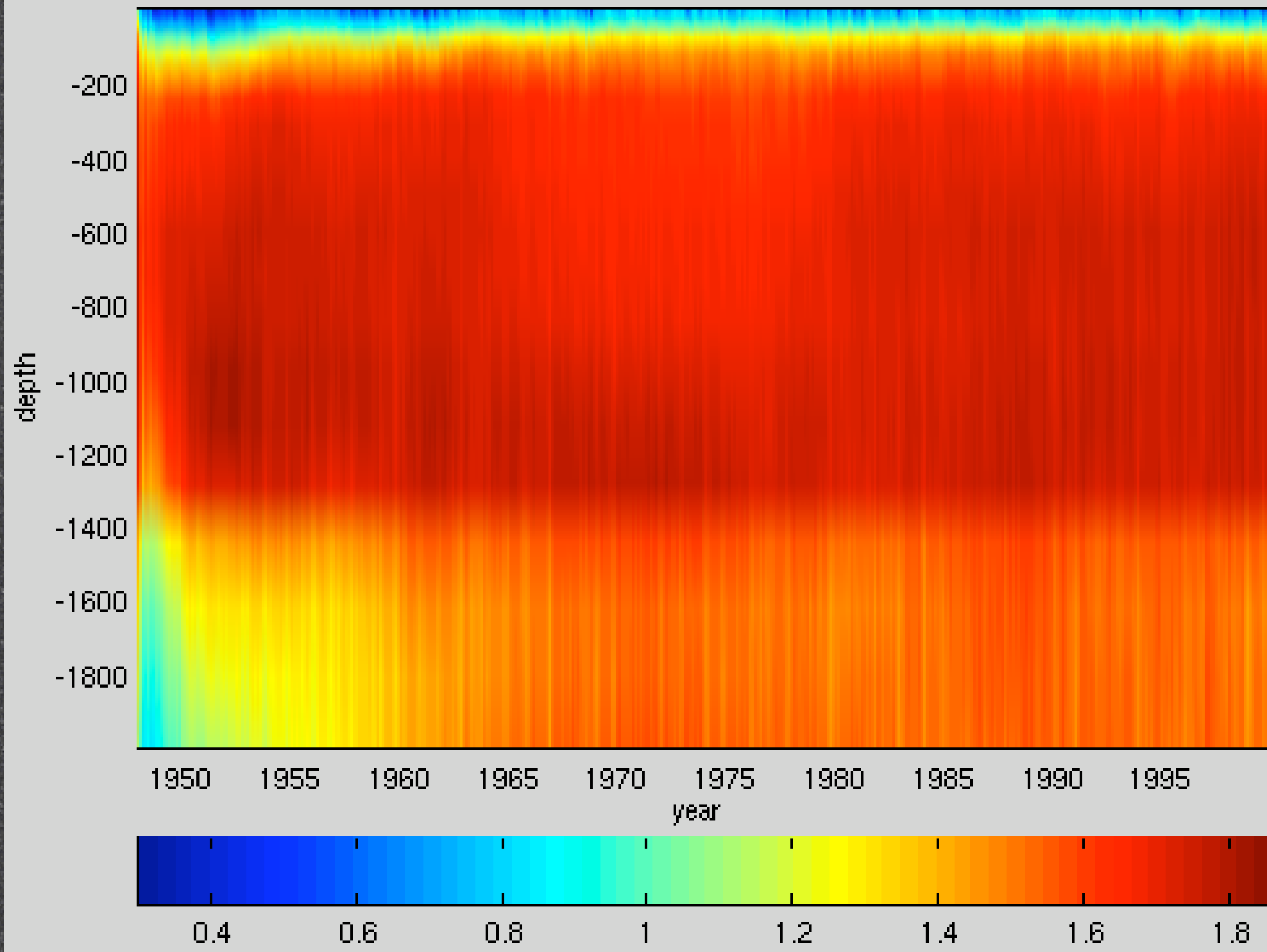
LANL speed



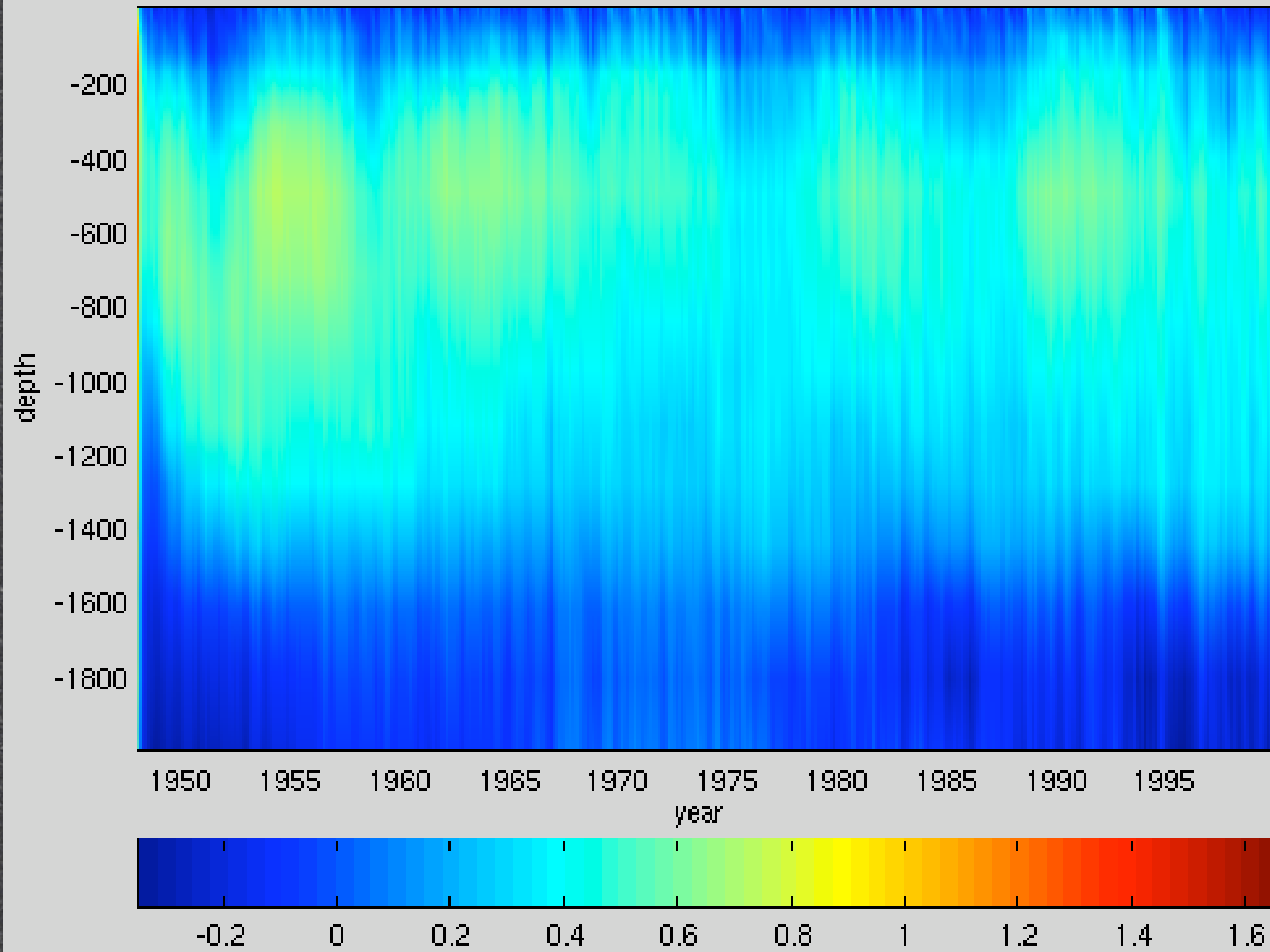
Conclusions:



IOS topostrophy

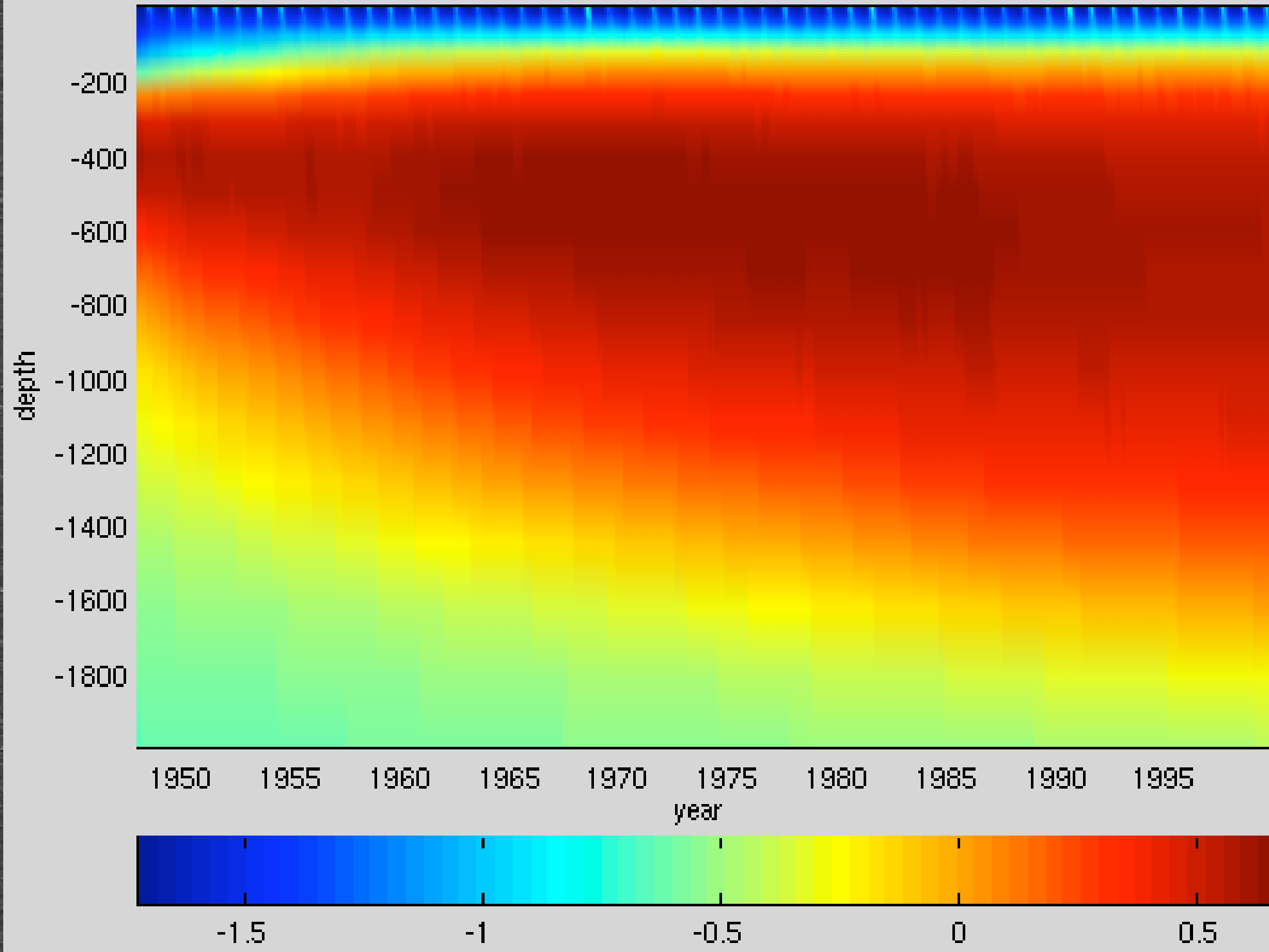


IOS topostrophy





IOS temperature



IOS temperature

