Development of a daily gridded MSLP data set over the North Atlantic region using ICOADS

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Outline

- Data sources
- Quality control and gridding issues for marine component
- Grid box uncertainty estimates
- Issues to resolve
- Some diagnostics

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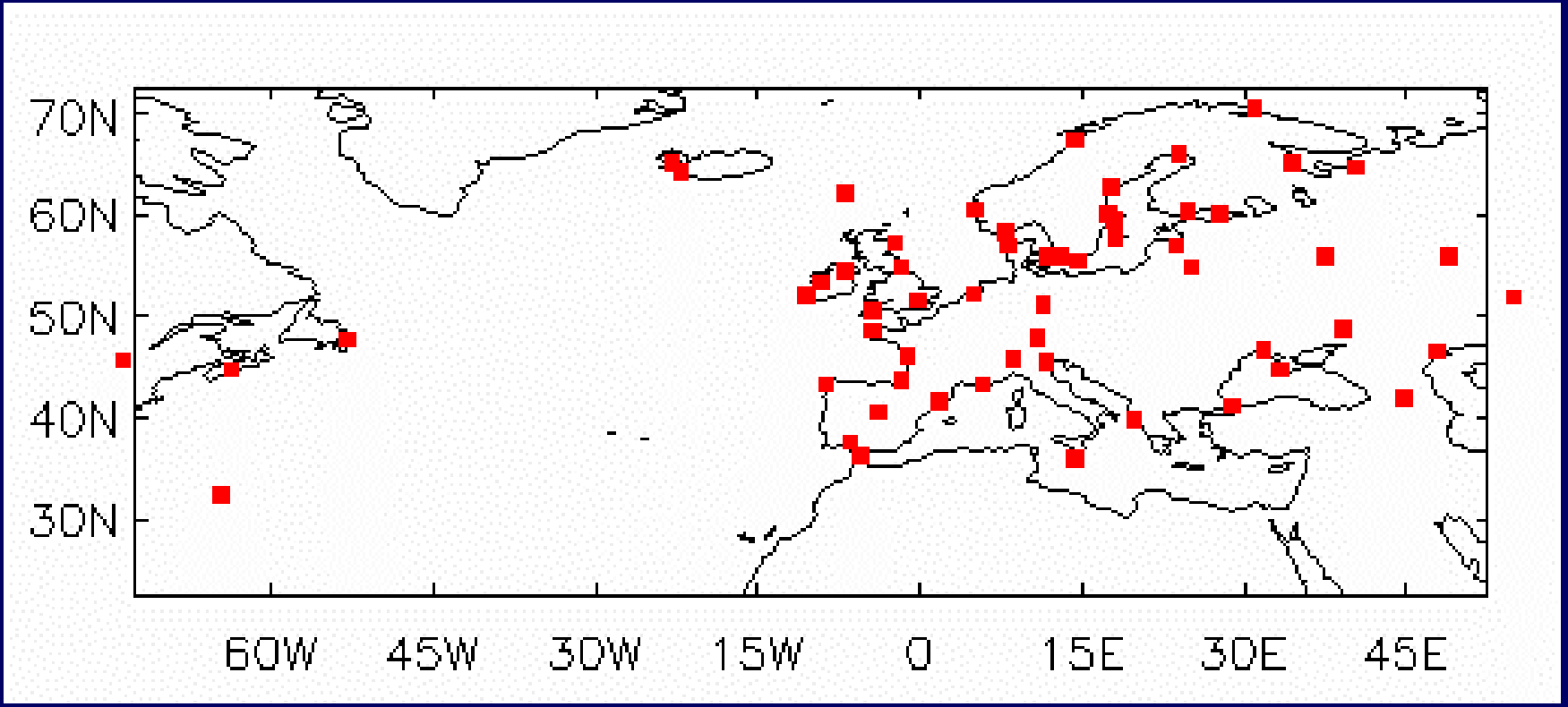
Distribution of terrestrial stations



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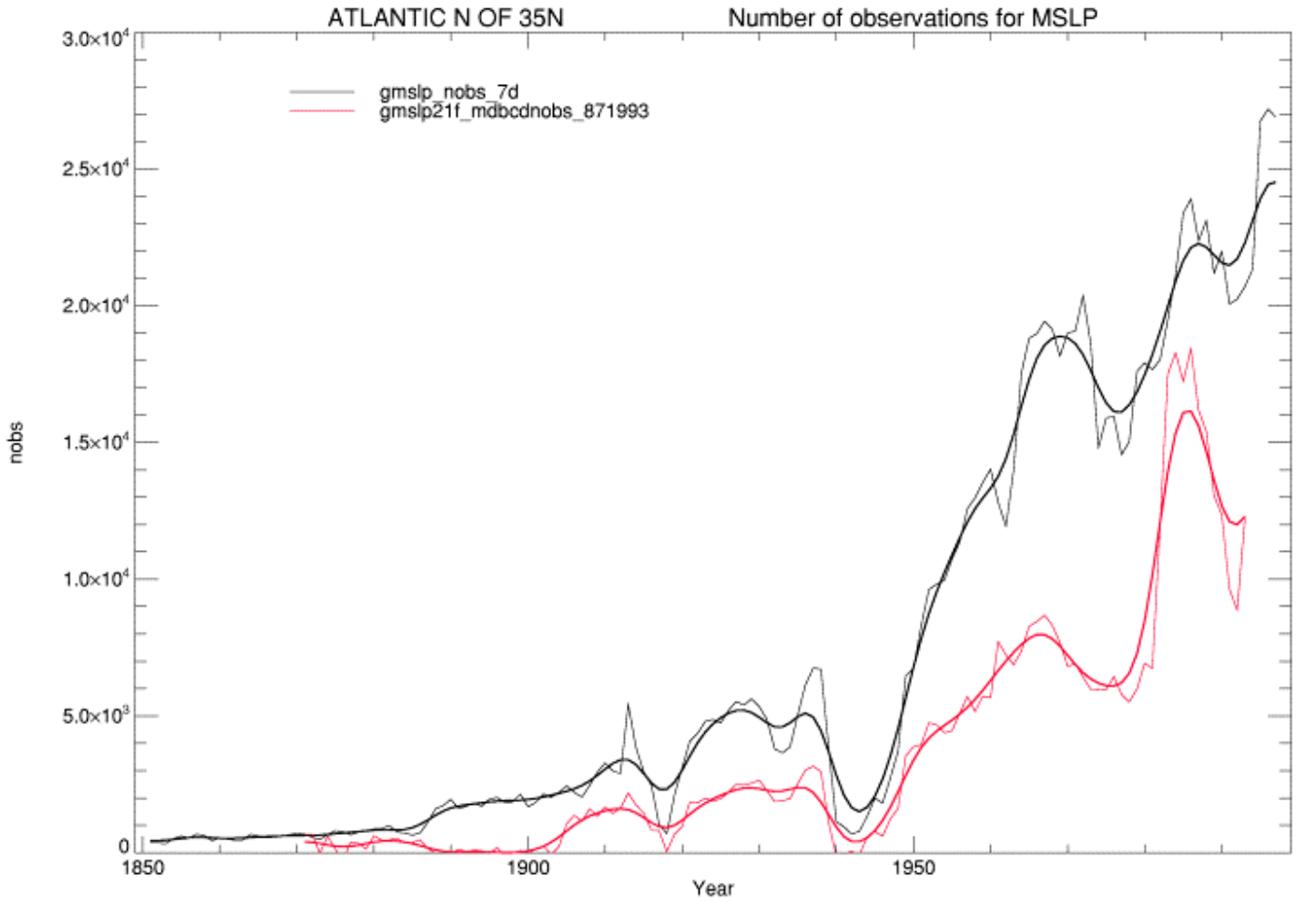
Improved coverage due to ICOADS



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Quality control and gridding procedure (marine)

- correct for the diurnal & semi diurnal oscillation
- QC background field removed and residuals are screened (eg. against a critical ‘max’ value and measure of intra monthly variability)
- residuals are gridded onto a 1x1 degree grid
- daily residual is formed by taking the median of all observations over a 7 degree concentric area, centred on each 1x1 degree target box. Serving to smooth data rich regions and infill data sparse regions
- background field added back to daily median residual value

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7 degree ‘smoothing’

‘smoothing’	‘in filling’
0 0 0 0 0 0 0	- - - - - - -
0 0 0 0 0 0 0	- - - - - - -
0 0 0 0 0 0 0	- - - - - - -
0 0 0 X 0 0 0	- - - X - - -
0 0 0 0 0 0 0	- - - - - - -
0 0 0 0 0 0 0	- - - - - - -
0 0 0 0 0 0 0	0 0 0 0 0 0 0

‘0’ = data present, ‘-’ = no data, ‘X’ = target box

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Grid box uncertainty estimates

$$G = M + E_S + E_M + E_{QC}$$

- Have monthly estimates of sample error (E_S) after Parker, 1984
  - though E_S doesn't contain spatial component
- Estimates of the measurement error (E_M) taken from Ingleby, 2000
- How to account for error associated with the 'smoothing procedure' (E_{QC})?
- Adapt to daily data?

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New procedure to estimate grid box uncertainty

- using NCEP-reanalyses, withhold data to represent historical sampling and apply gridding and QC procedure.
- Repeat with *n* realisations, randomly withholding data, and compare each realisation with complete fields
- Will provide an estimate of the spatial and temporal sampling error and the error associated with the QC and gridding procedure

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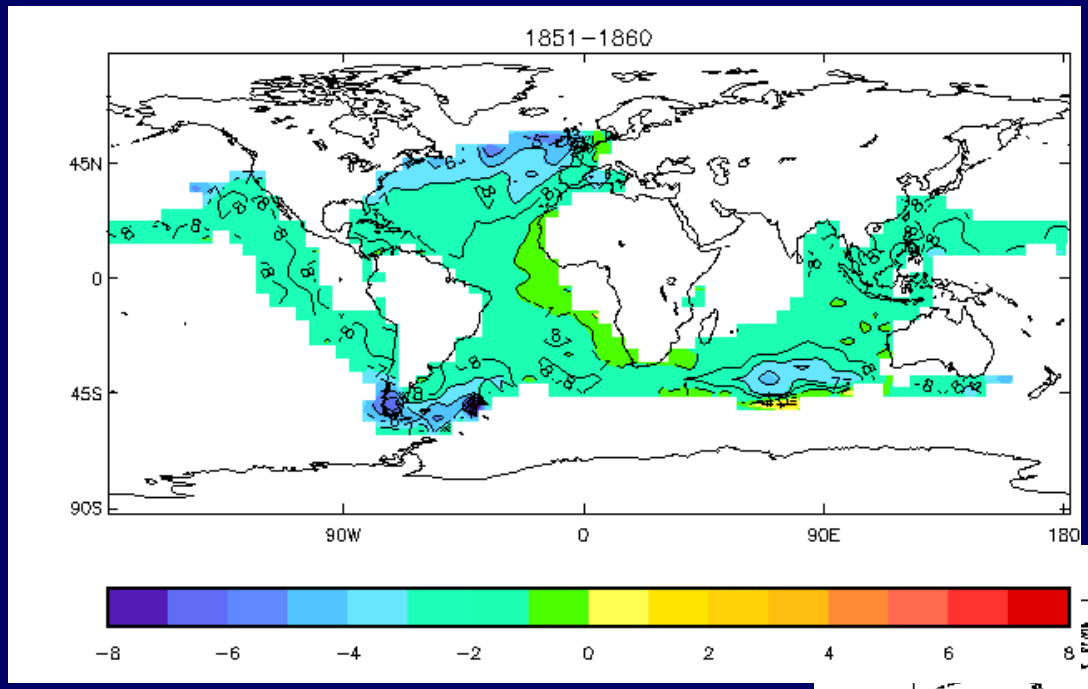
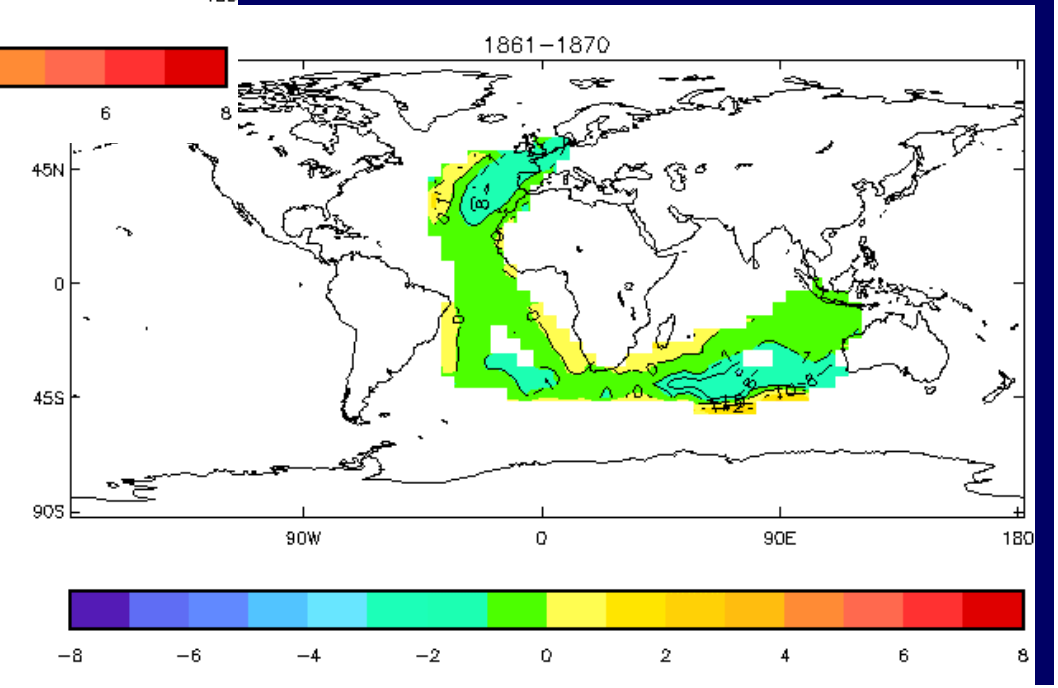
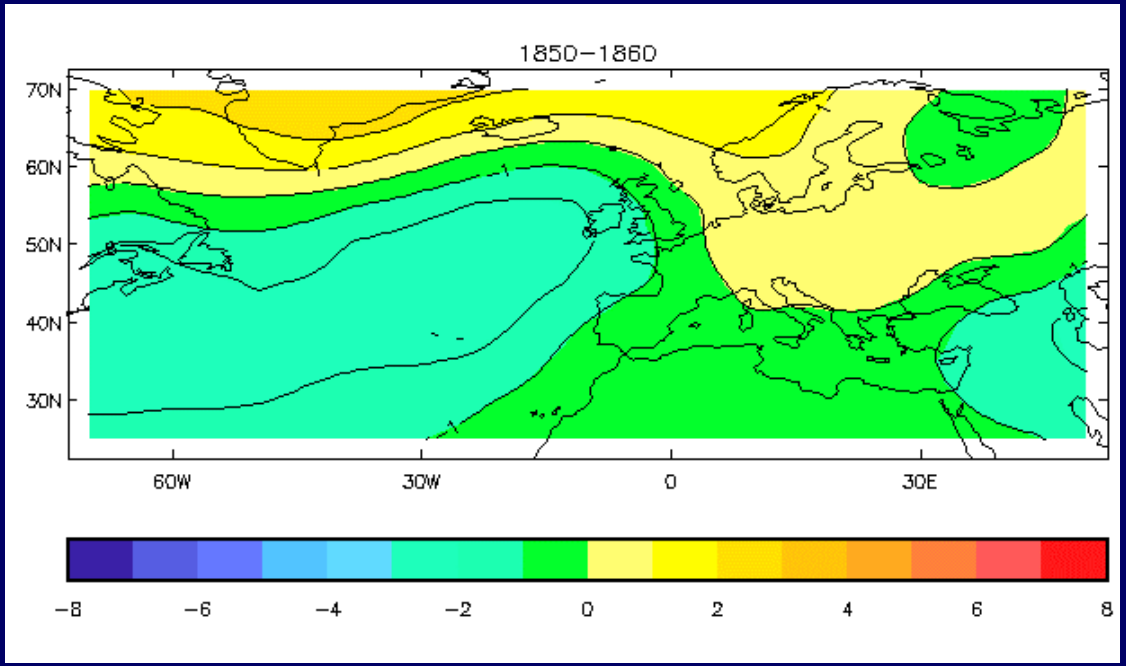
Anomalously low MSLP

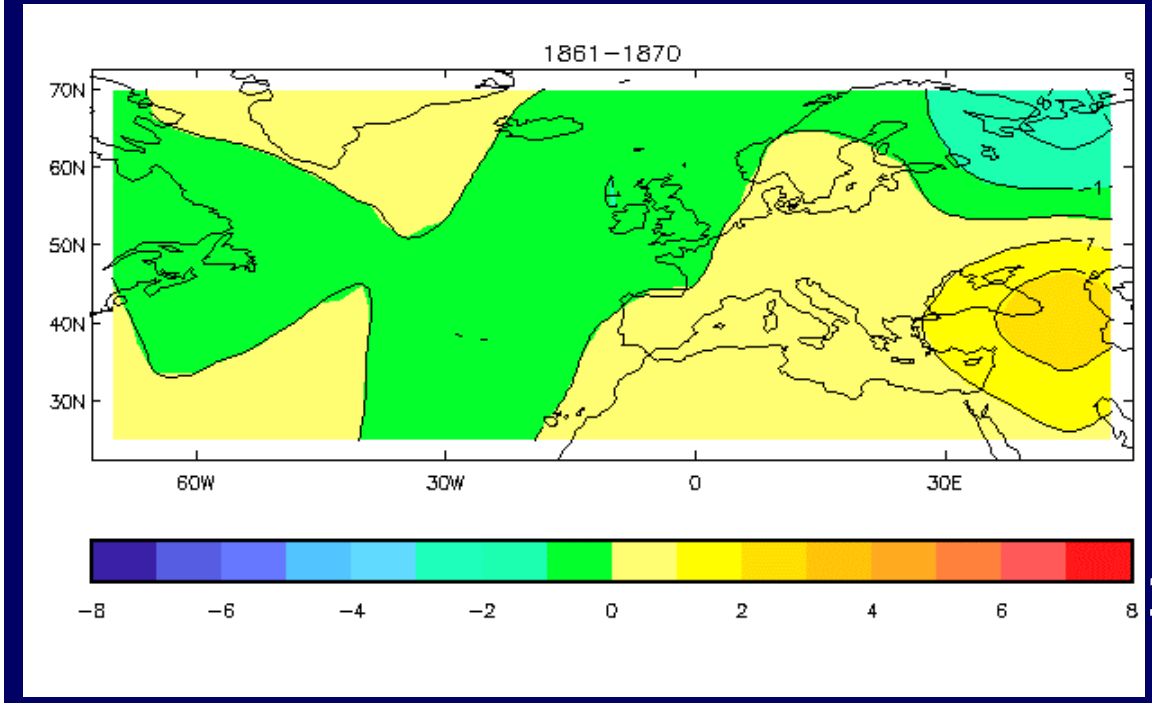




Decadal anomalies over EMULATE region



1850-1860



1861-1870

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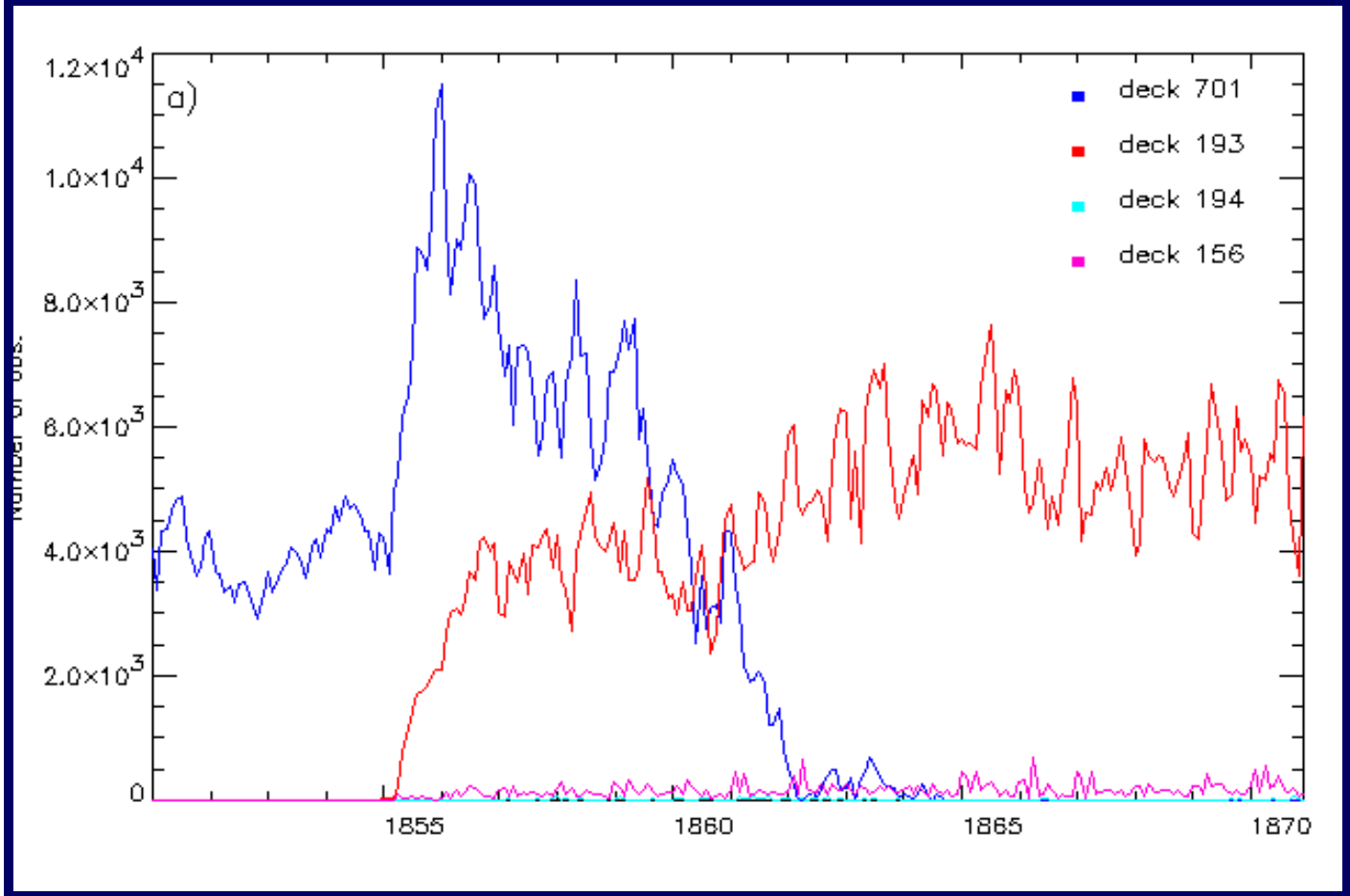
Who was reporting?



- 1850-1855 just deck 701 (US Maury) was reporting
- 1855-1862 deck 701 observations decline and deck 193 increase

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What are some possible causes?

- Bernoulli Effect
  - discovered by Daniel Bernoulli, through his work on the influence of wind speed on local MSLP measurements. Simply, pressure is lower in a moving fluid than a stationary fluid
  - Have compared gridded fields of deck 701 and deck 193 and found some indication that differences are greater in ‘windy’ regions and less so in ‘calm’ regions.
  - Some evidence in Maury’s instructions, but not conclusive

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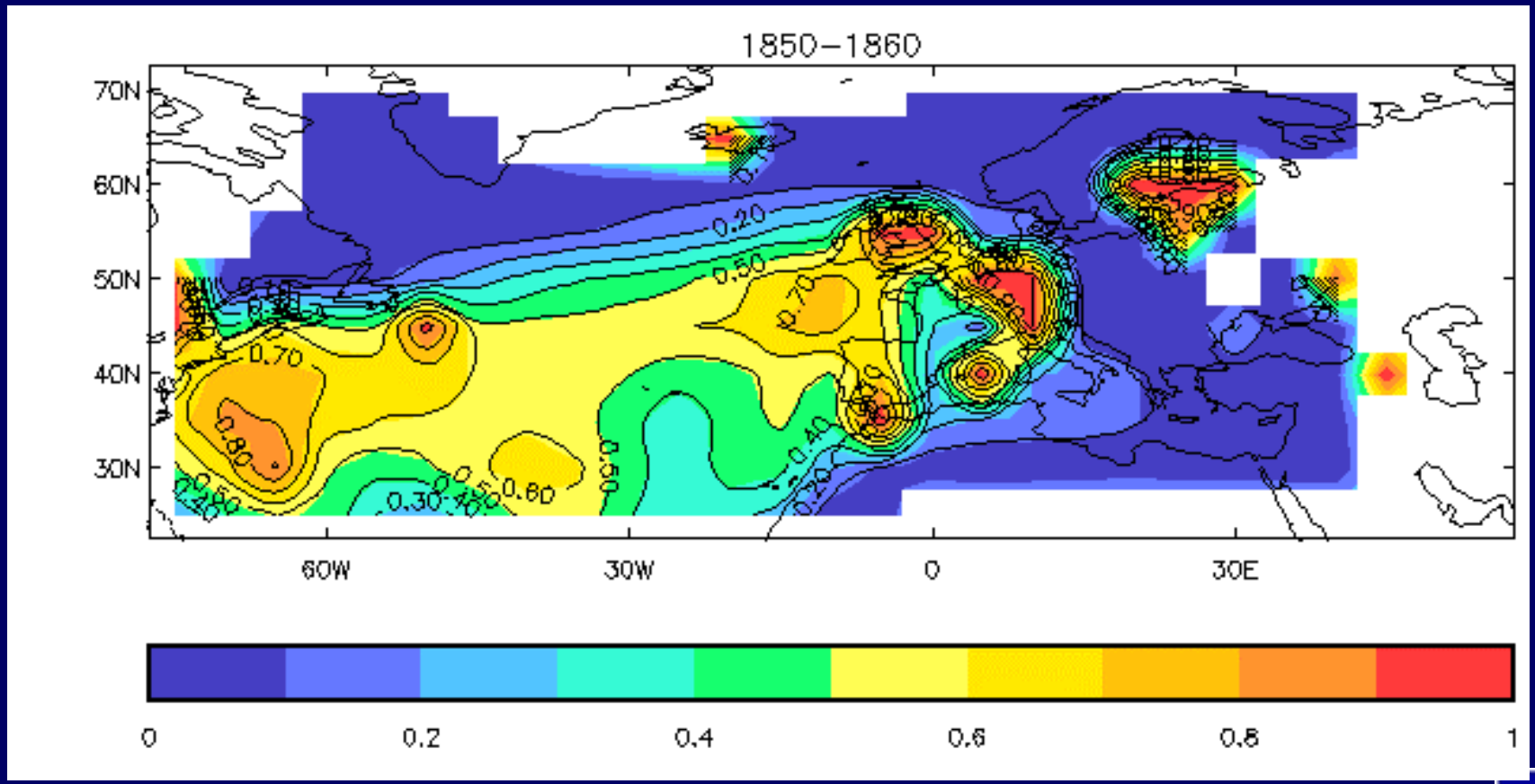
Data density: 1850-1860



Will have significant improvement with inclusion of Russian stations in version 2

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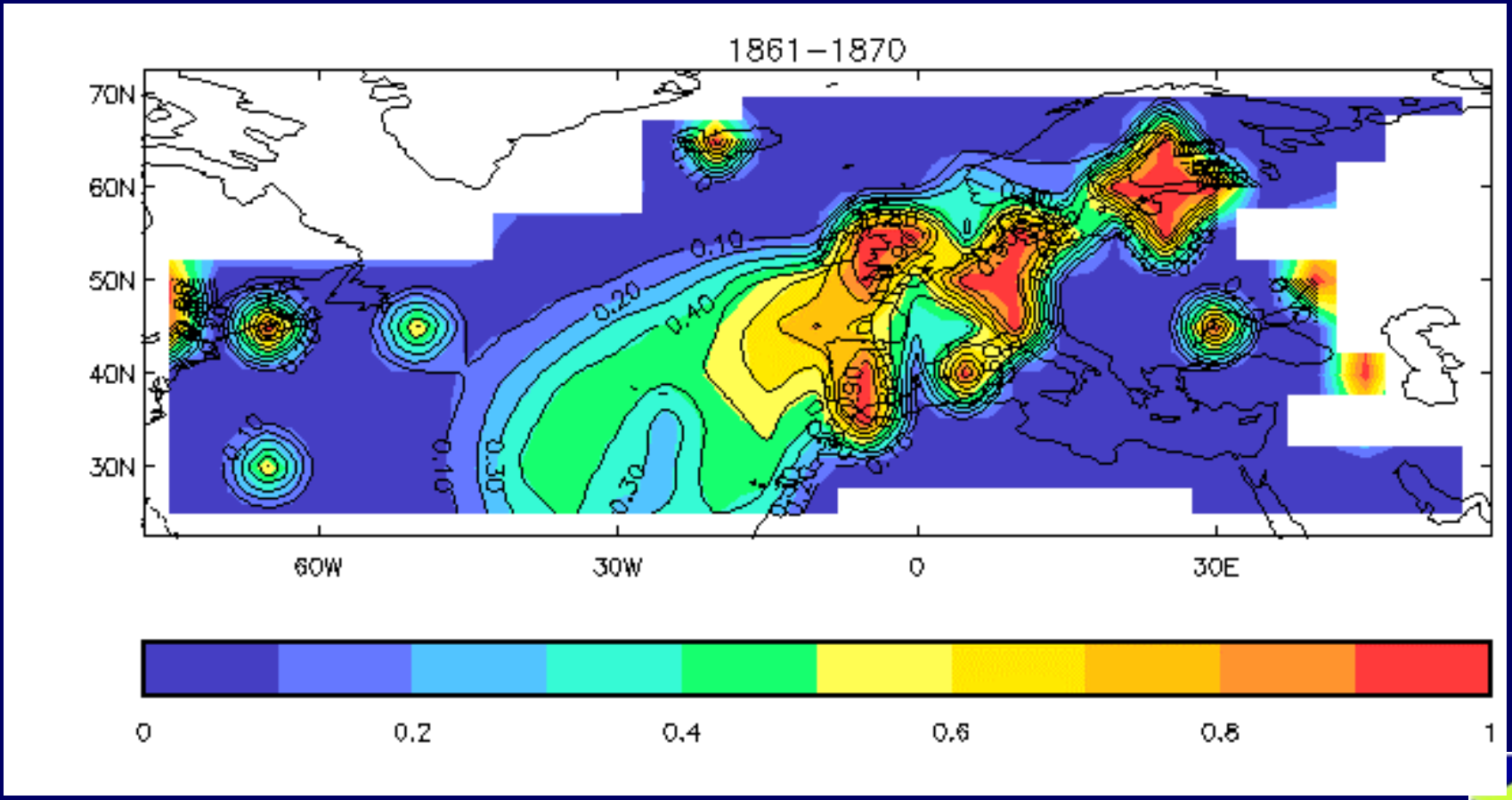
Data density: 1861-1870



US Maury observations decrease

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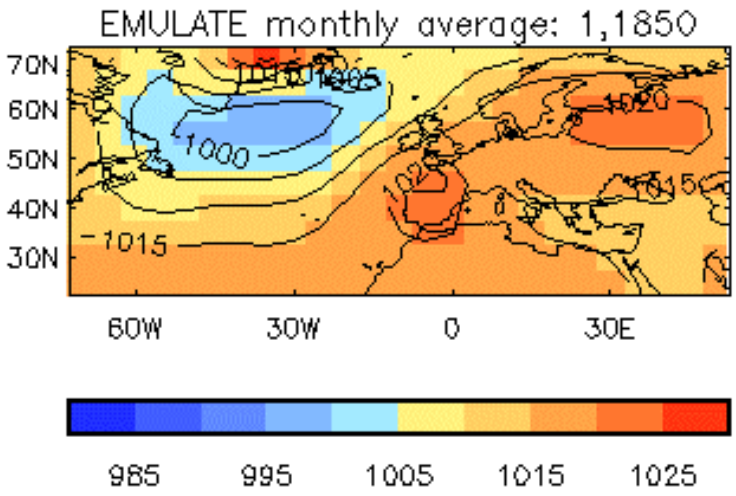
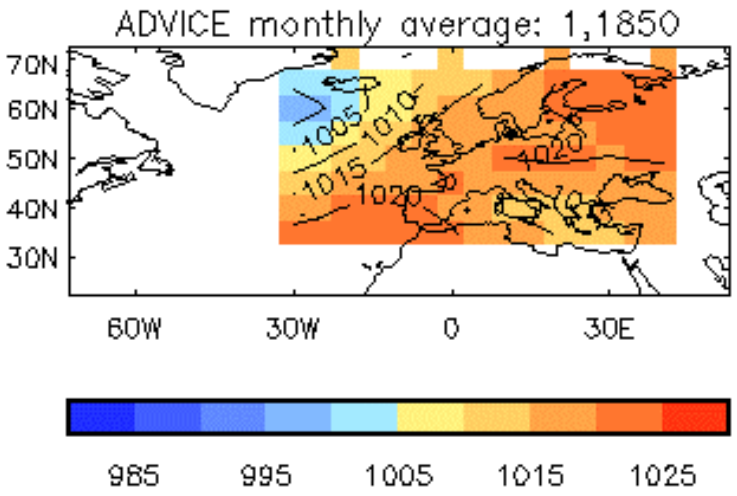
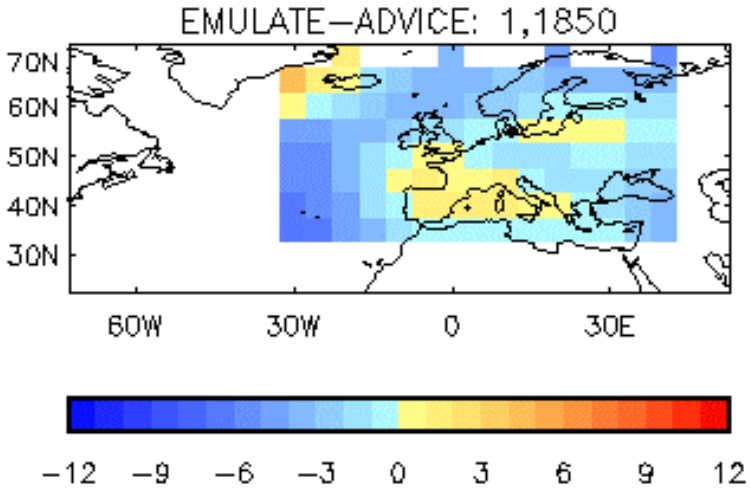
Comparisons with monthly ADVICE







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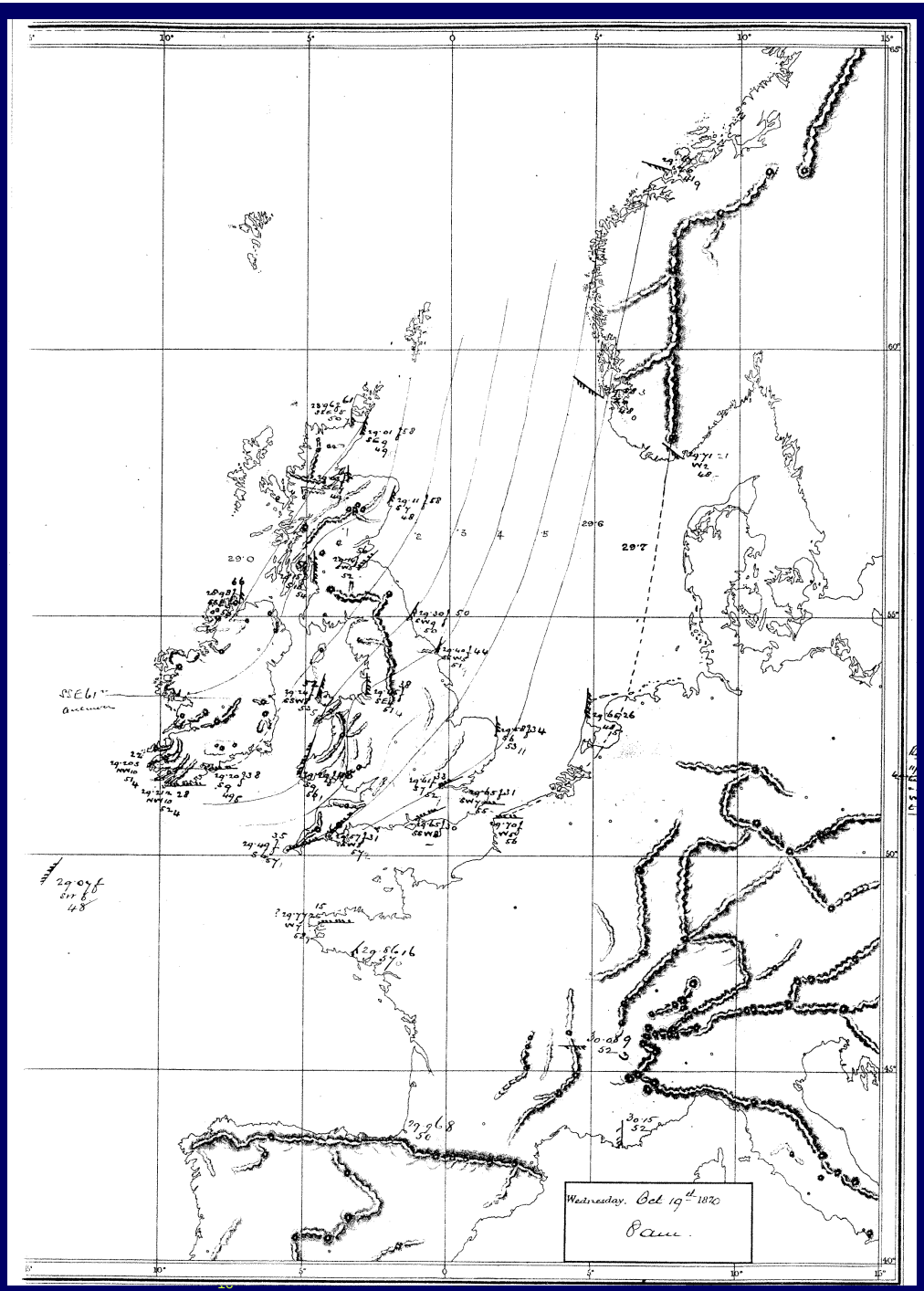

19th October, 1870

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Storm of 19th Oct, 1870