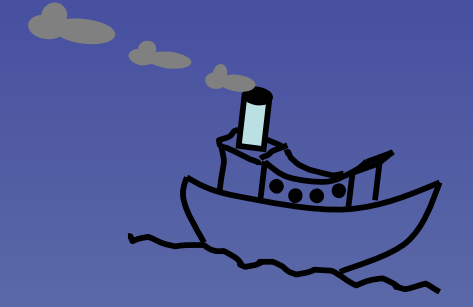


# Creating a Global Humidity Dataset – Progress with the Marine Component

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## 1. PROJECT SUMMARY

### AIM:

Create a global gridded monthly mean dataset of surface vapour pressure, relative humidity and specific humidity anomalies from 1973 to the present

### MOTIVATION:

Water vapour is the most important greenhouse gas and has significant implications for the global energy budget and hydrological cycle. It likely plays a key role in modulating the climate's response to external forcings through feedback processes. The accurate quantification of recent changes in water vapour content is imperative to our ability to further understand, and reduce uncertainties surrounding future climate.

### THE PLAN:

HOURLY LAND DATA from NCDC GRIDDED TO MONTHLY MEAN 5x5 FIELDS

ICOADS and NCEP MARINE DATA GRIDDED TO MONTHLY MEAN 5x5 FIELDS

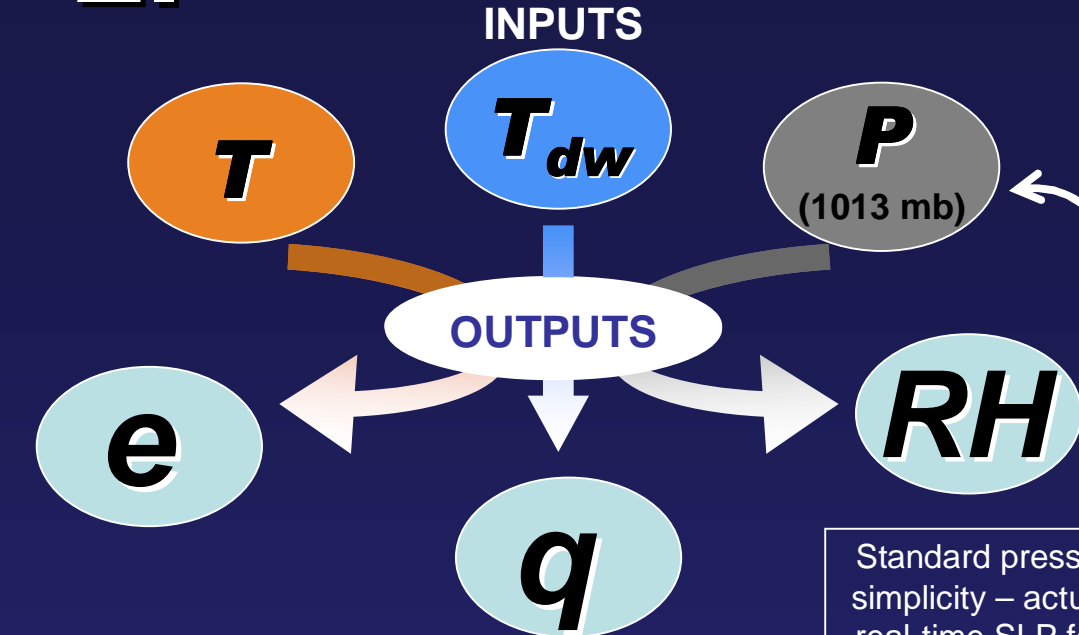
BLENDING GLOBAL PRODUCT IN  $e$ ,  $q$  and  $RH$

Trend and timeseries analyses

Comparison with HadCRUT2v

Comparison with model output from HadGem including detection and attribution tests

## 2. METHOD



Standard pressure chosen for simplicity – actual variations in real-time SLP found to have a negligible effect on calculated humidity output

### QUALITY CONTROL

The bias of daytime marine air temperature due to solar exposure of thermometers has been found to have a negligible effect on humidity. Thus humidity observations during day and night can be used. The uncorrected air temperature should be used for humidity calculations (Kent & Taylor, 1996). Other quality control issues include:

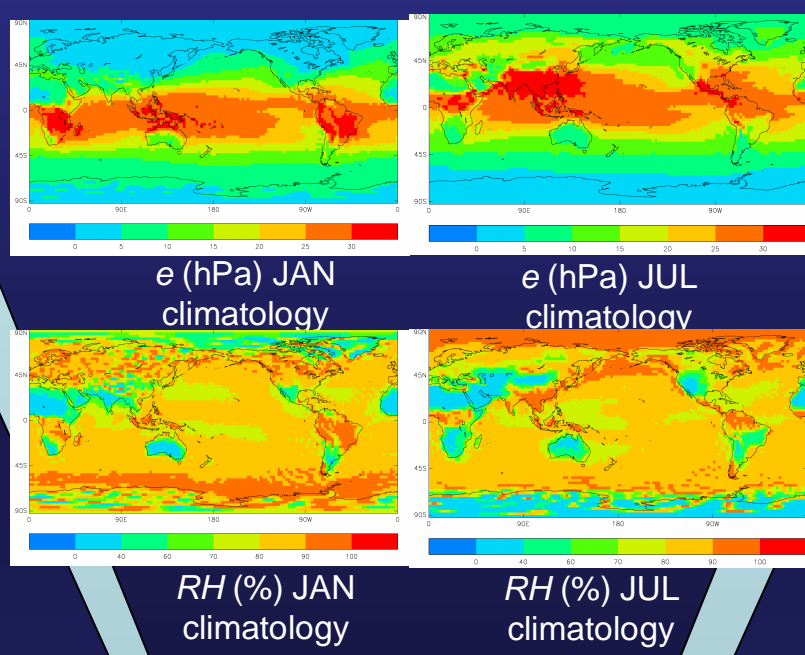
- OUTLIERS - remove outliers from climatology
- BAD  $T$  or  $T_{dw}$  - remove values where  $T$  or  $T_{dw}$  do not exist or where  $T_{dw} > T$  or where  $T$  fails 'OUTLIERS' or 'BUDDY'
- BAD  $RH$  - remove values where  $RH < 60\%$  (a constant open water source should inhibit drying beyond this) or  $RH > 100\%$
- FOG - remove values where fog is present but  $RH < 90\%$
- WINDS - flag values with very low/high wind speeds for later investigation into integrity of humidity values
- BUDDY - 'buddy' checking
- BAD INFO - location, date, time checking

## 3. CLIMATOLOGIES

First cut climatologies have been derived from NCEP Reanalyses for 1974-2003. This period is chosen for consistency with the land data.

These climatologies appear to underestimate humidity compared to the data in some coastal regions especially the Persian Gulf.

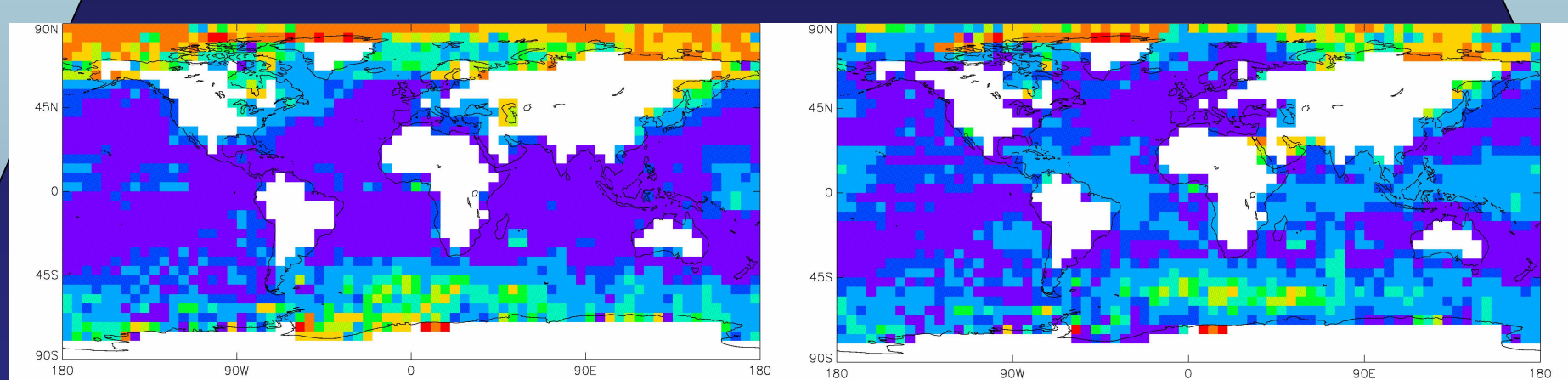
Climatologies derived from actual data will be used later on to produce the end-product.



## 4. QC TEST RESULTS

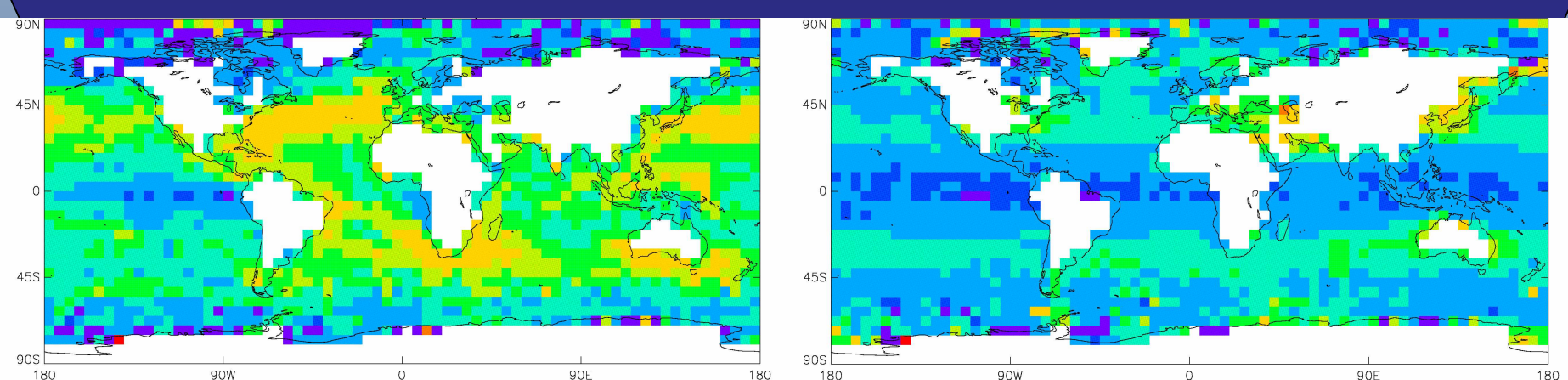
QC results for the ICOADS dataset 1973-1997 relative to vapour pressure

QC TEST	% of all Observations
BAD $T$ or $T_{dw}$	56.1
BAD INFO	1.9
OUTLIERS	0.4
BUDDY	19.4
BAD $RH$	2.5
Total good Observations	34.5



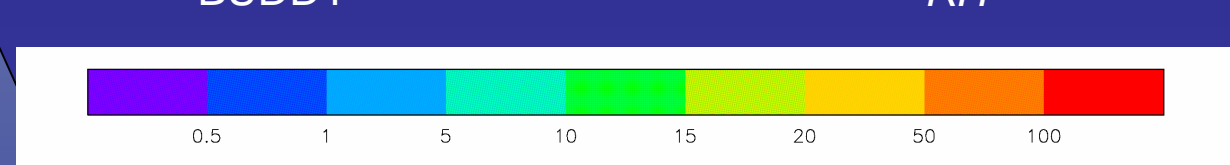
% of all obs. with a vapour pressure value that fail 'BAD  $T$  or  $T_{dw}$ '

% of all obs. with a vapour pressure value that fail 'OUTLIERS'



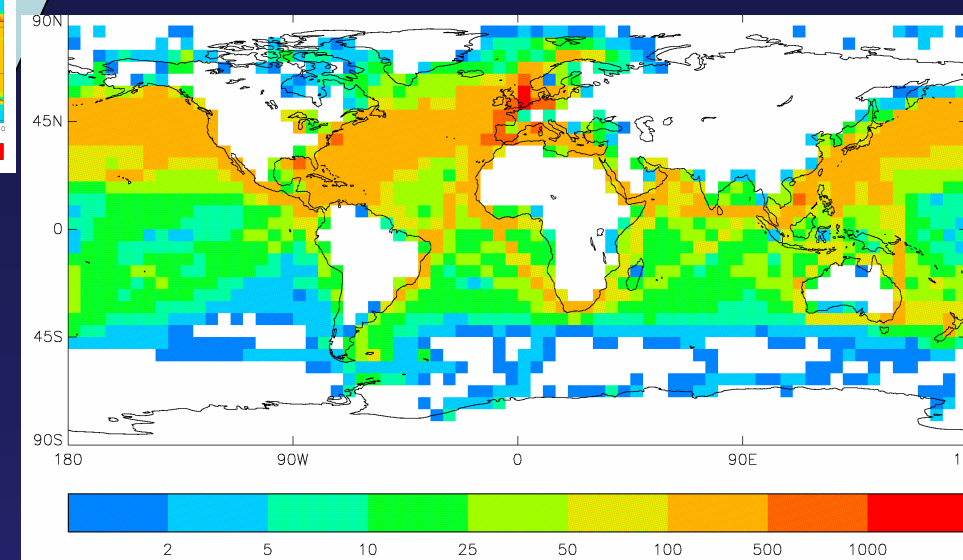
% of all obs. with a vapour pressure value that fail 'BUDDY'

% of all obs. with a vapour pressure value that fails 'BAD  $RH$ '



COLOUR SCALE

## 5. 'GOOD' DATA AND FUTURE WORK



Mean number of 'good' observations per grid square per month between 1973-1997.

'Good' observations pass all QC tests – see Quality Control section.

Further work will include:

- creating a climatology from the actual ICOADS data and using that as an outlier check rather than NCEP – this will hopefully rectify the possible under-representation in NCEP of humidity in the Persian Gulf.
- some comparison of different versions of grids to investigate uncertainty due to decisions made regarding data to keep / remove and observation density per grid.
- the addition of NCEP data from 1997 to present to extend the dataset.

### FUTURE WORK?

The effect of ship heights / types: the later start of this dataset (1973) precludes any major changes but differences in source heights could be large. This and different platform types (buoys etc...) may introduce biases in specific regions.

Wind, especially very low wind speeds may impede evaporation of the wet-bulb and so could introduce bias and should be investigated more.

References:  
Kent, E.C. & Taylor, P.K., (1996), Accuracy of humidity measurement on ships: Consideration of solar radiation effects, *J. Atmos. Ocean. Tech.*, 13, pp1317-1321

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