Section 5

The gridded reanalysis data therefore is interpolated at the station location using inverse distance weighted (IDW) average technique[2] for comparison with observation. Indian continent gets high wind during south-west monsoon, a period of four months from June to September. The monthly mean wind speed profiles of reanalysis data have shown good agreement with observations and with each other.

It is found that, all reanalysis monthly mean values under-estimate the observation values for most of the cases though they catch the trend successfully. The reanalysis data also captured the prevailing south-west wind direction of observation successfully. However, the reanalysis data sets failed to frame the correct diurnal variation as per observation for some stations.

Overall, the statistical analysis of RMSE, MAE and BIAS of MERRA, ERAI, NNRP and FNL shows small variations with observations. However, ERAI reanalysis performed better than other reanalysis data, even if the selection of reanalysis data for WRA still depends on the location of site.

Interannual and Decadal Variations of Moisture Flux by Asian Summer Monsoon and Associated Rainfall Anomaly Patterns in China

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The NCEP/NCAR reanalysis data (NCEP-R1) and the ECMWF reanalysis data (ERA-40) for the period of 1958-2002 are used to estimate interannual and decadal variations of vertically integrated moisture flux (VIMF) by Asian summer monsoon (ASM) and investigate their association with summer rainfall anomalies based on monthly precipitation at 160 stations in China.

The results show that both VIMF by ASM and summer rainfall in China exhibit obvious biennial rhythms as revealed by time coefficient of the leading EOF mode. When summer VIMF is strong (weak) in the south Asia monsoon region, a dipole VIMF anomaly in the East Asia – western North Pacific is propitious to negative (positive) VIMF convergence anomalies in the middle and lower reaches of the Yangtze River and the Yangtze-Huaihe valley but positive (negative) VIMF convergence anomalies in South China and North China, which result in a meridional tripole structure of rainfall anomalies in eastern China, i.e., droughts (floods) in the middle and lower reaches of the Yangtze River and the Yangtze-Huaihe valley but floods (droughts) in South China and North China.

On decadal scale, persistent floods in the middle and lower reaches of the Yangtze River but persistent droughts in South China and North China are mainly linked with weakening of VIMF by ASM and a dipole VIMF anomaly in the western North Pacific after the end of 1970s. In view of the in-phase relationship between summer rainfall anomalies and VIMF convergence anomalies in China, the analysed results also show interannual and decadal variations of VIMF by ASM can be better described by the ERA-40 reanalysis than the NCEP-R1 reanalysis.

Interannual variations and secular trends in winter North Atlantic jet stream wind speeds and turbulence from the GADS data set

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The North Atlantic jet stream is important for aviation, influencing flight routes, journey times, turbulence, and possible effects of climate change. This study used a dense set of aircraft observations relative to the Aircraft Meteorological Data Relay (AMDAR) system and with the addition of a turbulence measure (the Global Aircraft Data Set, GADS).

Wind speeds and turbulence were obtained every 4 sec (~ 1 km spacing) at a fixed flight level (FL370, ~ 225 hPa). We examined the winter (DJF) North Atlantic jet stream region to study secular trends in wind speed and "light" turbulence. The observations were compared with reanalyses over a 12 year period, winter 2002-2013 (labeled by the January year), and a CMIP study of doubled CO_2.

We have a sufficiently large dataset (3 billion total global observations, 500,000 for the North Atlantic per winter month) that we are able to subdivide the results into five longitude bands at ten degree intervals running from 60°W to 10°W and find quite coherent behavior along the North Atlantic jet. As would be expected, our results match the interannual reanalysis variations of the North Atlantic jet.

They are also consistent with conclusions of Delcambre et al. (2014) for doubled CO_2: that the wind speed for the jet exit region shows a strengthening and the core shows a weakening. The trends in "light" turbulence are less clear, because the rarity of turbulence and the large interannual variability demands a longer data set to expose any secular trends. Our primary results are independent of computer models.