Search for an astronomical site on the Arabian Peninsula: meteorological and climatological analyses

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The Arabian Peninsula is the richest in oil but the poorest in A&A -Astronomy and Astrophysics- the largest telescope in the region doesn't exceed 45cm! To promote A&A education and research, we propose that all the countries of the region work together to install an optical regional observatory (telescope diameter > 2 meters) on an accessible summit, somewhere within the mountains of the Arabian Peninsula. The first step is to make a climatological and meteorological study of the highest summits of the region.

A preliminary study has revealed only one mountain peak above 3000 meters in Saudi Arabia, one in Oman, but more than thirty in Yemen.

Of all these summits, we have narrowed the selection to six candidate sites, on which we are performing detailed meteorological and climatological analyses. Our database is composed mainly of "Reanalysis" datasets from the European Centre for Medium Range Weather Forecasting (ECMWF) and the National Center for Environmental Protection / National Center for Atmospheric Research (NCEP-NCAR). Reanalysis datasets are reconstructions of all available past weather station data, aeroplane sensor data, weather balloon data, weather ship data, and satellite data from the 1950s onwards using sophisticated numerical weather prediction and data assimilation models.

This paper discusses ECMWF and NCEP-NCAR images of Arabian Peninsula for the following parameters, at a monthly mean temporal resolution:

1. Temperature variability at 700hPa

2. Precipitation

3. Geopotential height of the 700hPa and other surfaces

4. Winds at 700hPa

5. Winds at 200hPa

6. Low, Mid and Upper Cloud Cover

7. Precipitable water content (integrated humidity)

8. Aerosol loading

The paper also explains the local test methodology that should be adopted in the six candidate sites.