



## On the fog variability over south Asia

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An increasing trend in fog frequencies over south Asia during winter in the last few decades has resulted in large economical losses and has caused substantial difficulties in the daily lives of people. In order to better understand the fog phenomenon, we investigated the climatology, inter-annual variability and trends in the fog occurrence from 1976 to 2010 using observational data from 82 stations, well distributed over India and Pakistan. Fog blankets large area from Pakistan to Bangladesh across north India from west to east running almost parallel to south of the Himalayas. An EOF analysis revealed that the fog variability over the whole region is coupled and must therefore be governed by some large scale phenomenon on the inter-annual time scale. Significant trends were found in the fog frequencies and this increase is not gradual, as seen in the humidity, but shows two distinct regimes shifts in 1990 and 1998 with respect to both mean and variance. The fog is also detected in ERA-Interim 3 hourly, surface and model level forecast data when using the concept of "cross-over temperature" combined with boundary layer stability. This detected fog index is able to reproduce the regime shift around 1998 and shows that the method can be applied to detect fog over south Asia. The inter-annual variability seems to be associated with the wave train originating from north Atlantic in the upper atmosphere that causes higher pressure over the region, resulting in increased boundary layer stability and surface-near relative humidity. The trend and shifts in the fog occurrence seems to be associated with the gradual increasing trend in relative humidity from 1990 onwards.