



The Observed Spatio–Temporal Variability of Dutch Fog

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The formation of fog is the result of several competing processes. On a large scale, synoptic weather plays a significant role. Locally, its formation is controlled by such factors as land cover (and related surface properties) and topography. The Netherlands is an excellent location for regional studies of fog. The country is characterized by highly variable land use and industry, with dense cities surrounded by agricultural regions, and a strong influence of the North Sea on national climate. Yet, it is devoid of significant topography. Thus, the relative influence of regional land use variability on fog occurrence can be assessed in the absence of complex and obscuring terrain effects.

The climatology of fog in the Netherlands is assessed over a period of 45 years using observations from a dense network of weather stations throughout the country. Overall fog occurrence and interannual variability are assessed. On a national scale, inter-annual variability is linked to large-scale synoptic forcing, including changes in the wintertime pressure-gradient forcing over Northern Europe. Within the country, a comprehensive in-depth analysis of regional differences between fog occurrence is made, together with an assessment of local physical factors that could bias fog formation in one location over the other. Regional variability in local fog climatology is shown to be strongly related to the mesoscale influences of urbanization and the North Sea, with some locations found to experience over twice as much fog as others. From this finding, a simple and robust fog index was distilled, which combines the water and urban fraction surrounding a station, and is proposed for practical use. The index is extensively tested and able to accurately sort the stations according to their relative fogginess. Such an index can be used to assess a site's climatological favourability for fog formation, without the need for any a priori meteorological observations.