

A Comprehensive Observational Overview of Dutch Fog

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The Netherlands 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, making it an excellent location for assessing the relative influence of regional land use variability on fog occurrence, in the absence of complex 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, interannual variability is linked to large-scale synoptic pressure forcing, including changes in the strength and position of the Icelandic Low/North Atlantic Oscillation. 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.