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Circulation regimes associated with incursions of Bluetongue disease to the UK

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Bluetongue, an economically important insect-borne animal disease, can be spread over long distances by carriage of its biting midge vectors on the wind. The weather conditions which influence the midge's flight and subsequent transport are controlled by synoptic scale atmospheric circulations. Results from an atmospheric dispersion model, NAME, were used in combination with principal component analysis (PCA) and cluster analysis to determine the main synoptic situations present during times of midge incursions into the UK from the main European continent. The PCA was conducted on high-pass filtered mean sea level pressure data for a domain centred over north-west Europe from 2005 to 2007. A clustering algorithm applied to the PCA scores indicated the data should be divided into 5 classes for which averages were calculated, providing a classification of the main circulation regimes present. Midge incursion events into the UK were found to mainly occur in two categories; 64.8% were associated with a pattern displaying a pressure gradient over the North Atlantic leading to moderate south-westerly flow over the UK and 17.9% of the events occurred when high pressure dominated the region leading to south-easterly or easterly winds in the area at risk. The winds indicated by the pressure maps generally compared well against observations from a surface station and analysis charts. This technique could be used to assess the frequency and timings of disease incursions in the future on seasonal or decadal timescales, currently not possible with dispersion modelling methods.