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Characterisation of marine boundary trace gas observatories; air mass sectors, seasonal variation and long range transport

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The UK Met office's NAME atmospheric dispersion model has been used to develop station footprints for the Weybourne atmospheric trace gas observatory in the UK and the Cape Verde Observatory in the Atlantic Ocean. Model output was captured for every 3 hours over a period of 3 years, tracking air mass origin for the previous 10 days. The most common air mass directions and pathways for each station were classified and each 3 hour period was assigned to a specific trajectory type.

The long term trace gas measurements from these stations were used to calculate an average composition (of O3, NO2, CO, CN, VOCs etc.) for each type of trajectory over the period. The chemical data were also de-seasonalised so the true difference in composition due to air mass origin was found. At the Cape Verde observatory the main seasonal variation between the air masses was the higher frequency of air masses coming from Saharan Africa, bringing dust to the station. Weybourne receives a large amount of Arctic air, particularly in spring. This classification of air mass types arriving at the stations allows us to follow the origin and reactivity of key atmospheric species.