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Quantifying the sensitivity of North Atlantic cyclone development to atmospheric precursor fields

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North Atlantic cyclones can develop due to a wide variety of mechanisms. This makes it difficult to determine typical evolution characteristics and hence to quantify the relative importance of factors contributing to their development. In this study cyclones identified in the ERA-Interim, 6-hourly, reanalysis fields have been clustered according to their genesis location (west or east Atlantic) and their time to maximum intensity. These relatively homogeneous clusters allow relevant mean precursor fields (such as upper-level potential vorticity) to be created, whilst differences among cyclones in each cluster provide diversity. Using a sensitivity analysis technique, the linear relationships between maximum cyclone intensity and various atmospheric precursors for each cyclone cluster have been calculated. Confidence in the linear relationship is calculated and the spatial variability of the precursor fields taken into account. This standardisation of the sensitivity results allows quantitative comparison among different precursor fields to be performed. Results from this quantitative representative sensitivity analysis show that the maximum intensity of cyclones originating in the east Atlantic is more sensitive to diabatic processes than for those originating in the west Atlantic. This suggests that east Atlantic cyclones may be particularly sensitive to climate warming.