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Medium- to long-range forecast applications for high impact weather using predefined weather regimes

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The Met Office updated its probabilistic weather regime forecast tool in 2015 to use a new set of 30 and 8 objectively derived regimes. This forecast tool, called Decider, assigns forecast scenarios from several ensemble forecasting systems to the closest matching regime definition. This summaries key aspects from the large volumes of data which ensembles provide.

Research is ongoing to link these new weather regimes to specific weather impacts. Certain weather impacts (such as coastal flooding, extreme heat, and poor air quality) are more likely to occur during the occurrence and persistence of a few specific weather regimes. For example, extreme heat may be more likely to occur under a select few anticyclonic regimes in summer. Once a relationship has been established, forecasts for these high impact regimes can be used to highlight an increased risk of particular impacts at relatively long lead times.

The relationship between weather regimes and specific impacts can be used to develop bespoke (customer focused) applications. These are designed for use by operational meteorologists in generating long range risk assessments for particular weather impacts. One example is Coastal Decider, which is designed for use by the UK Flood Forecasting Centre. Coastal Decider is most useful beyond the seven day forecast range of the Met Office storm surge and wave ensembles. High risk regimes for high impact surge and wave events were derived for 21 UK coastal sites by relating daily historic regime classifications to data from a wave hindcast and tide gauges. An increased probability of these high impact regimes in the forecast, coinciding with a spring tide, leads to a greater risk of coastal flooding. A pressure anomaly metric is also used to estimate the magnitude of surge and wave events given the occurrence of a particular regime.