



POTENTIAL PREDICTABILITY OF SOIL MOISTURE DEFICIT IN BRITAIN FROM THE NORTH ATLANTIC OSCILLATION

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BACKGROUND Soil moisture deficit (SMD) is the quantity of water from rainfall or irrigation needed to return a soil to field capacity i. e. the maximum water holding capacity when free drainage can occur. In England, water loss from evaporation and transpiration from plants is low over winter and soils are at or near to field capacity until April in most years. Increasing potential evapotranspiration (PE) in April can lead to a substantial SMD developing if rainfall quantity is less than PE. In a few years with very dry winters a moderate SMD may develop in Britain over winter exacerbating a high SMD from subsequent low spring rainfall. Advance warning of high SMD may be of benefit in planning for increased demand for irrigation water. The winter North Atlantic Oscillation (NAO) may provide a means of forecasting early spring SMD since the NAO in winter is associated with climate variables determining SMD.

METHODOLOGY The potential predictability of spring SMD from the winter NAO was assessed using the April SMD calculated by the UK Meteorological Office software MORECS for 1978 to 2000. This SMD is calculated for 40 km grid squares and the mean SMD for those grid squares with more than 15% of their area covered by cereals were used to represent the cereal-growing area of mainland Britain. The mean SMD for each week is calculated by MORECS, and the mean of these four values for April was used in further analysis. The SMD was regressed on Hurrell's monthly NAO indices for the winter.

RESULTS AND CONCLUSION A positive effect of February NAO on April SMD was found ($R^2=36\%$; $P=0.002$) indicating possible potential in forecasting. Further work is necessary to establish whether the relationship is determined by persistence of

winter SMD or by lag effects on April climate, and also to determine whether rainfall or PE is the dominant intermediary factor. Since winter NAO influences the following summer rainfall in Britain (Kettlewell et al., *Weather*, in press), a relationship between winter NAO and summer SMD may also exist.