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Solar Variability and Climate Change

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The need to distinguish natural from anthropogenic causes of climate change makes it important to understand and quantify any impact of the Sun. In this talk I will outline what is known about variations in solar output and review the evidence for solar influences on climate over a range of timescales. When the Sun is more active our work shows the response in temperature is not a warming of the tropics but mainly of mid-latitudes, along with a weakening and poleward shift of the jet streams and storm-tracks. Using climate models we have found that an important factor driving this response is the absorption in the stratosphere of solar UV radiation and we have identified a dynamical coupling mechanism which transfers a solar signal from the stratosphere to the atmosphere below. This means that simple assessments of the solar impact based on energy balance ideas may be effective in estimating global mean temperature change but might be neglecting important effects on regional climate. During the last solar cycle minimum the Sun was in a state of very low activity and some satellite measurements have suggested that the solar spectrum has been behaving in a strange and unexpected way. The talk will finish with a discussion of recent work on the implications of these spectral variations.