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On the dynamically driven temperature response in the middle atmosphere to the solar cycle signal.

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Noctilucent clouds (NLC), formed in the summer polar mesosphere, are exposed to solar radiation around the clock. These clouds consist of water ice, and are thus expected to be sensitive to changes in the solar Lyman alpha flux since it efficiently destroys water vapor in this region. Moreover, during solar maxima, the upper parts of the atmosphere are in general significantly warmer due to physical and chemical processes that are intensified at high solar activity. It is thus surprising that a clear solar cycle signal in NLC is hard to trace. We investigate how the circulation in the summer mesosphere is affected by changes in the solar flux using a 30-year run from the extended and nudged version of the Canadian Middle Atmosphere Model (CMAM30). We find that, as a result of a chain of wave-mean flow interactions primarily initiated in the winter stratosphere, the solar cycle signal from direct solar heating is suppressed by an enhanced circulation which adiabatically cools the region at increased solar activity.