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Eclipse effects on field crops and marine zooplankton: the 29 March 2006 total solar eclipse

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Abstract. Some effects in the biosphere from the Total Solar Eclipse of 29 March 2006 were investigated in field crops and marine zooplankton. Taking into account the decisive role of light on plant life and productivity, measurements of photosynthesis and stomatal behaviour were conducted on seven important field-grown cereal and leguminous crops. A drop in photosynthetic rates, by more than a factor of 5 in some cases, was observed, and the minimum values of photosynthetic rates ranged between 3.13 and 10.13 μmol CO_2 m^{-2} s^{-1}. The drop in solar irradiance and the increase in mesophyll CO_2-concentration during the eclipse did not induce stomatal closure thus not blocking CO_2 uptake by plants. Light effects on the photochemical phase of photosynthesis may be responsible for the observed depression in photosynthetic rates. Field studies addressing the migratory responses of marine zooplankton (micro-zooplankton (ciliates), and meso-zooplankton) due to the rapid changes in underwater light intensity were also performed. The light intensity attenuation was simulated with the use of accurate underwater radiative transfer modeling techniques. Ciliates, responded to the rapid decrease in light intensity during the eclipse adopting night-time behaviour. From the meso-zooplankton assemblage, various vertical migratory behaviours were adopted by different species.

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