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Cosmic rays and clouds - a reassessment using MODIS data

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In order to investigate possible links between cosmic rays and clouds, the response of clouds to sudden decreases in the flux of galactic cosmic rays (Forbush decrease events) has been investigated using cloud products from MODIS. By focusing on pristine Southern Hemisphere ocean regions we examine areas which are particularly susceptible to changes in cloud condensation nuclei (CCN) concentrations, and where a cosmic ray signal should be easier to detect than elsewhere. While previous studies on the subject have used data from ISCCP, the higher spatial and spectral resolution of MODIS allows for a more thorough study of microphysical parameters such as cloud droplet size and cloud water content, in addition to cloud amount. In general, the results show no systematic correlation between any of the cloud parameters and galactic cosmic radiation. When the area of study is split into several sub-regions, one sub-region in the Atlantic Ocean shows statistically significant correlations compatible with a GCR-induced enhancement of CCN and cloud droplet number. However, the lack of correlation in any of the other 5 sub-regions suggests that this may only be a statistical co-incidence. Introducing a time lag of a few days for clouds to respond to the GCR signal did not change the overall results. In conclusion, this study does not yield support to the hypothesis of a GCR-induced increase in cloud droplet number and hence cloud optical depth over pristine ocean regions, where the clouds are highly susceptible to such changes. However, such a connection can not be ruled out either based on the results of this study.