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Seasonal co-variability of surface downwelling shortwave radiation for the 1982-2009 period in the Arctic

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The decreasing of the sea ice cover observed in the Arctic represents a strong indicator of the ongoing climate changes. Several physical processes are contributing to these changes. The study of the co-variability of sea ice concentration (SIC) with other physical parameters may provide a useful tool for better understanding the strength and nature of the Arctic sea ice decline. This work aims to investigate the mutual variability between the seasonal fields of SIC and the downwelling surface shortwave radiation (SIS) in clear sky conditions. For the 1982-2009 period, SIC and SIS monthly data were collected from the National Snow and Ice Data Center (NSDIC) and from the Satellite Application Facility on Climate Monitoring (SAF-CM), respectively. The data analysis through the method of maximum covariance (MCA) gave interesting results: i) during the summer season, which is the relevant season for sea ice melting, regions of maximum co-variability are located close to the Barents Sea and the Kara Sea; ii) for the same areas, expansion coefficient time series (of principal modes), show statistically significant (at 95%) correlations with climate oscillation indices, like the Northern Annular Mode (NAM), the North Atlantic Oscillation (NAO) and the Pacific North America (PNA) pattern.