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Statistical properties of the seasonal cycle in the Mediterranean area

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We present a statistical analysis of seasonal cycle of the 1957-2002 records of the surface and upper air temperature of the Mediterranean area, as described by the NCEP and ERA40 reanalyses. We obtain time-varying estimates of the seasonal cycle for each grid point of the fields under investigation by performing the Fourier transform on moving windows. We observe that at surface the phase and amplitude of the seasonal cycle are strongly characterized by the signature of the underlying surface. The seasonal cycle has larger amplitude and smaller phase delay with respect to the solar cycle for land grid-points. In the troposphere, large-scale features related to the ocean-continent contrast come into play and the surface signature is essentially lost. A thorough analysis of the statistical significance of the trends of the amplitude and phase of the seasonal cycle in the time interval considered is presented. A discussion of the spatial cross-correlation properties of the considered fields of amplitude and phase of the seasonal cycle is also given. This works supports the idea that climate change studies are much more reliable when upper air data are taken into account.