Geophysical Research Abstracts
Vol. 15, EGU2013-1418, 2013
EGU General Assembly 2013

Effects of the solar activity on the modes of atmospheric variability in the Southern Hemisphere

Radan Huth (1,2), Reinaldo A. Maenza (3), and Rosa H. Compagnucci (3)

(1) Charles University, Faculty of Science, Dept. of Physical Geography and Geoecology, Praha 2, Czech Republic (huth@ufa.cas.cz, +420 2 21951367), (2) Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic, Praha, Czech Republic, (3) Dept. of Atmospheric and Oceanic Sciences, University of Buenos Aires, Argentina

We analyze effects of the variations of solar activity on mid-tropospheric circulation of the Southern Hemisphere in terms of modes of low-frequency variability. The modes are detected by principal component analysis (orthogonally rotated) in an S-mode. The analyzed domain is the Southern Hemisphere Extratropics south of 20°S (inclusive); the circulation is characterized by 500 hPa heights; the analyzed period is 1950-2011. Separate analyses are conducted for individual seasons, that is, winter (JJA), spring (SON), summer (DJF), and autumn (MAM). Solar activity is described by Wolf sunspot numbers. Monthly mean values of both circulation and solar variables enter the analysis. The modes are detected separately for the months with a low and high solar activity, and differences between the spatial patterns of the modes (principal component loadings) are tested for statistical significance. All the modes detected exhibit variations in their spatial extent, position of action centers, and intensity in response to the solar activity. Our findings include that during solar minima in winter, the Southern Annular Mode strengthens and that the two circumpolar wavenumber-3 wavetrains break down into two parts. The strongest effects appear near to and west of South America and concern mainly the modes consisting of two meridional dipoles shifted by half a wavelength. The one-point correlation maps for the action centers of the modes indicate that the changes in the appearance of the modes are real and not artifacts of the analysis method.