

**SPARC SOLARIS & HEPPA intercomparison activities: Global aspect of the QBO modulation of the solar influence on the stratosphere**

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Labitzke and van Loon showed that the solar influence appears more clearly when the data are stratified according to the phase of the stratospheric Quasi-Biennial Oscillation (QBO) defined around 50 hPa. North polar temperature is proportional to the solar activity during the west phase of the QBO, but the relationship reverses during the east phase. It should be noted, however, that this relationship is valid only locally, late winter in the North polar region of the lower stratosphere. It should also be noted that the question is not a solar influence on a relationship between the equatorial QBO and the polar temperature (Holton-Tan relationship). More recent work of K. Labitzke showed a QBO modulation of the solar influence on the global stratosphere throughout the year. The fundamental aspect of the solar influence in the stratosphere regardless of the QBO, should be a tropical warming in early winter and its evolution to a polar warming in the following season: late winter in the northern hemisphere and spring in the southern hemisphere, depending on the difference of the seasonality of planetary wave activity in both hemispheres. The essential feature of the impact of the QBO on the solar signal then appears as a change in the timing of the transition from a tropical to a polar warming. During the QBO west phase, the transition to polar warming occurs earlier than during the east phase. In fact, this difference of the timing creates a difference of the solar signal in the North Polar region in February, which produces the well-known Labitzke-van Loon relationship. Dynamical influence of the solar UV heating starts from the zonal wind change in the upper stratosphere-stratopause region. It is suggested that the modulation of the solar signal by the QBO originates from a modulation of the zonal winds in the subtropical upper stratosphere and stratopause region produced by a secondary circulation associated with vertical shears of the equatorial QBO.