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Oscillations of the local verticals due to solar activity cycles

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The oscillations of the verticals depend on local and global variations of the Earth gravity field, due to surface changes in particular, which are excited by atmosphere and ocean variations, driven by solar activity cycles. The influences of 11-year, 22-year and 45-year sunspot cycles on the oscillations of the local verticals are investigated by means of latitude data from the observatories Carloforte, Gaithersburg, Kitab, Mizusawa, Ukiah, Pulkovo and Washington for the period 1899.8-1979.0, sunspot and Wolf's numbers. The 22-year solar magnetic cycles are represented by extended time series of Wolf's numbers, determined by sign alternation of even 11-year sunspot cycles. The 45-year solar cycles are determined from the Index Sa of equatorial solar asymmetry, which is calculated by the formula Sa=(Sn-Ss)/(Sn+Ss), where Sn and Ss are sunspot areas of northern and southern solar hemispheres. Strong correlation exists between the smoothed time series of the local oscillations of verticals and the Index of equatorial solar asymmetry Sa. The local Earth gravity response to the equatorial solar asymmetry influence is determined by means of linear regression models for individual observatories. The common cycles with periods of 11, 22 and 45 years between the solar activity and local oscillations of the verticals are investigated after removing the local gravity responses to the equatorial solar asymmetry, which appears as the most powerful excitation source.