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Precursors of solar flares in microwave range

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We present four cases of quasi-periodic pulsations (QPPs) of microwave emission from solar active regions (ARs) on pre-flare phase. We used the Nobeyama Radioheliograph (NoRH) and Nobeyama Radio Polarimeters (NoRP) daily observations. We computed the time series of maximum brightness temperature and total flux over selected field-of-view (FOV) in three cases and total solar flux in one case. We found that in all considered cases an increase in the power of QPPs before flares is observed. The duration of pre-flare wavetrains in periods of oscillations is approximately the same for all cases and is about 5-10 pulses. The effect of the occurrence of the QPPs before flares can be interpreted as a relationship between MHD waves propagating along the magnetic flux tube of sunspot and beginning of the flares and can be considered as a flare precursor.

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