

Investigation of humidity in the stratosphere and mesosphere from twilight spectrographic observations

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Long-term spectrographic twilight observations at Abastumani in 1960-2002 were used for measurement of the absorption band branch of the water vapour (1-3-1) in the region of 650 nm at the Solar depression angles within $4-10^\circ$. With allowance for function $f(z)$ describing the dependence of the absorbing gas mass on the twilight moment, vertical distribution and persistent concentration trends of the water vapour $m(\text{H}_2\text{O})$ were investigated at the altitudes of 15-70 km. A marked rise of $m(\text{H}_2\text{O})$ in the evening twilight compared with that in the morning one was found at high altitudes in the summer period of the year. This is connected with the airway of the sunbeams crossing the atmosphere in the upper-water and continental areas near the terminator against the observational place.

To study the trend of $m(\text{H}_2\text{O})$ the linear regression coefficients a_n were calculated having shown that within 1960-1970, on the average by all the heights, the trend was evidently negative ($a_n = -0.712 \pm 0.51$); in the period of 1970-1980 the trend is positive ($a_n = +0.30 \pm 0.26$), within 1980-1990 the trend is uncertain ($a_n = -0.10 \pm 0.26$) likewise characterizing the water vapour trend over the whole period of 1960-1990 ($a_n = -0.03 \pm 0.12$). At various heights $m(\text{H}_2\text{O})$ trends turned out to be different by the value and sign.