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Assessment of contribution of greenhouse gases, water vapour and cloudiness to global surface air temperature changes

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A contribution of the basic greenhouse effect components to the changes of global surface air temperature (SAT) has been assessed. The Earth's energy budget and the longwave energy transformation, in particular, were considered to investigate the mechanism of the influence of greenhouse effect (GHE) on global SAT. As is known, some part of the outgoing terrestrial radiation is retained in the atmosphere by greenhouse gases (GHGs) such as CO_2, CH4, N2O, water vapour (WV) and cloudiness. The analysis of the changes in global SAT, GHGs and WV concentrations for the period 1984 – 2010 has shown that these parameters have a trend to increase. The research into global cloudiness and the vertical distribution of cloud layers made it possible to trace both positive and negative trends, namely the increase of availability of middle and high clouds has a positive trend while the increase of availability of global clouds and low clouds have a negative trend. Making use of the regression analysis relationships between global SAT and the components of greenhouse effect were obtained. It is shown, that the availability of total clouds and low clouds result in climate cooling, while the availability of middle and high clouds cause the increase of global SAT. The analysis of these parameters made it possible to carry out parameterization of GHE. To identify non-anthropogenic possible reasons of global SAT changes the influence of GHE on global SAT has been analyzed, with El-Nino phenomenon being one of the possible reasons. It has been shown that the GHGs role in global SAT changes is not dominant.