Geophysical Research Abstracts
Vol. 20, EGU2018-2820, 2018
EGU General Assembly 2018


# Impact of Linewidth Narrowing on Climate Sensitivity

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Increasing greenhouse gas concentrations strongly affect the far-wing lineshape of molecular transitions. In particular, the finite time of molecular collisions as well as Dicke narrowing significantly reduce the absorption cross section in the far-wing region. It is known that this is essential to take into account when fitting atmospheric observations of the infrared radiance[1]. Using incorrect line profiles results in an overestimate of radiative forcing by several tens of per cent. This work performed a line by line computation using data downloaded from the Hitran database. For each line, a Voigt profile was modified to correct the far-wing lineshape. Over 100,000 lines originating from the various $CO_2$ isotopomers and other greenhouse gases CH4, N2O and $H_2O$ were considered. The computation developed fast numerical routines to solve the Schwarzschild equation. The calculations of the climate sensitivity were done for the standard temperature profiles for the atmosphere[2] and also take into account the observed altitudinal dependence of the greenhouse gas concentrations[3].

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2. NASA (1976), U.S. Standard Atmosphere supplements, 1976, U. S. Government Printing Office, Washington DC
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