



## **FUTBOLIN (Full Transfer by Optimized LINE-by-line methods): a new Radiative Transfer Code for Atmospheric Calculations in the Visible and Infrared**

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FUTBOLIN is a new algorithm to calculate line-by-line atmospheric emission/transmission spectra for planetary atmospheres in the 0.3 - 1000 microns spectral region (visible, near-Infrared, infrared, and far-infrared). The code has been compared with others, like GENLN2 and MODTRAN, and has been applied to the analysis of Earth and planetary spectra. It reads the spectral lines in HITRAN or GEISA format. The interaction with the code is extremely user-friendly. In addition to the spectroscopic file, and for the simplest calculation, the only mandatory input file is that containing the atmospheric profiles of the species involved in the calculation; but the user can control the calculation up to the finest detail (radius of the planet, spectral range, spectral sampling, irregular grid files, tangent altitudes to be covered in the calculation, filed-of-view or instrument line shape convolutions, spherical or plane-parallel atmosphere treatment, CO<sub>2</sub> line mixing, continuum absorption from H<sub>2</sub>O, O<sub>2</sub>, N<sub>2</sub> and CO<sub>2</sub>, treatment for rotational, electronic or rotational non-Local Thermodynamic Equilibrium (non-LTE) effects, selection of particular isotopes and bands, jacobians, viewing geometries, surface reflections, monochromatic and spectral albedo, types and combinations of clouds and coverage,...). The main purpose of FUTBOLIN is to generate spectra. Output options are radiance, transmission, absorption or optical depth spectra, infrared cooling rate spectra, radiance flux spectra, absorption coefficient, and cloud radiative effect ("cloud forcing") among others.