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Computation of Normal Modes for a spherical Planet with a non-adiabatic atmosphere : application to the Earth and Venus

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Thanks to technological advances over the past fifteen years the atmosphere is now a new medium for seismological investigation. Surface waves emitted after large earthquakes are known to induce, by dynamic coupling, atmospheric infrasonic and gravity waves propagating upward through the atmosphere. Those waves have been detected recently at ionospheric heights using a variety of techniques, such as Doppler or GPS ionospheric sounding. The theoretical description of the coupling processes and propagation in the atmosphere already take into account the viscosity of the atmosphere. However, for acoustic waves in atmosphere, the effects of thermal-conduction can reach 30% of the total dissipation. We describe a new theory taking into account the thermal conduction effects and which allows a more precise modelling of the propagation and provide the temperature fluctuation associated to the seismic waves at high altitudes. This theory is use to model waves and signals for different earthquakes, and the modelled data are compared to the observations and results discussed. Modelling is also performed in the case of Venus, and the perspectives of detection by ESA's Venus Express Spacecraft are specified.