Atmospheric disturbances related to thunderstorms and possible effects on weather and climate

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Thunderstorms are an important component of the Earth's weather and climate. In parallel to transient events as lightning such as TLEs and TGFs, they produce atmospheric waves in a broad frequency range. These waves include infrasound in the lower frequency range associated to lightning and sprites and gravity waves from convective cells and frontal systems. Infrasound are expected to have local or regional impact. At the contrary, gravity waves characterized by large wavelengths, reaching several tens to hundreds kilometres, could have a regional or global influence. Gravity waves originating in the troposphere produce a forcing on the stratosphere and contribute to a general stratospheric circulation motion with possible effect on climate. A review of previous observations of the disturbances related to thunderstorm activity will be presented. Processes at their origin will be discussed. It will be shown that the infrasound network developed in the frame of the Comprehensive nuclear Test Ban Treaty verification, completed by national and international stations, presents a large potential for thunderstorm gravity wave monitoring in Europe and Africa. Completed by lidars and airglow measurements in the mesosphere, it provides a new image of the dynamical coupling to different layers of the atmosphere up to the ionosphere. The work performed in the frame of the European ARISE project will be presented. Its links with the space projects TARANIS and ASIM will be discussed.