Evidence for bursts of high altitude millisecond electric discharges has been obtained at Perth, Australia, using a directional antenna recording HF signals over a wide frequency range, from 10 kHz to 1.3 GHz. The cause of these discharges is not known but they seem to originate in the mesosphere over regions of impending earthquake activity such as episodically in Indonesia and the South Pacific, and over active volcanoes in Indonesia undergoing a Plinian eruption. During an earthquake cluster in SW Australia HF signals have been recorded from about 500 km to closer range. The signals exhibited preferred vertical polarization suggesting that they originated from horizontal lightning strikes. A possible cause of these suspected mesospheric lightning strikes are positive ions accelerated upward from the stratosphere to the ionosphere. At first these ions form a homogeneous vertical current, then break up into bubbles of high ion concentrations separated by regions of lower ion concentrations, leading to strong electric fields. Prior to earthquakes massive air ionization is believed to take place at ground level, primarily O$_2^+$. The air laden with positive ions expands upward to the stratosphere and then feeds into the vertical ion current in the ionosphere, primarily O$^-$. In the case of Plinian volcanic eruptions large amounts of CO$_2$ and SO$_2$ are injected into the stratosphere, which become the source for ions accelerated upward to the ionosphere. The lower edge of the ionosphere reacts to the attendant changes in the vertical electric field through an increase in TEC (Total Electron Content).