



Energetic particle influences in Earth's atmosphere

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Energetic particles from outer space, known as galactic cosmic rays, constantly ionise the entire atmosphere. During strong solar storms, solar energetic particles can also reach the troposphere and enhance ionisation. Atmospheric ionisation generates cluster ions. These facilitate current flow in the global electric circuit, which arises from charge separation in thunderstorms driven by meteorological processes.

Energetic particles, whether solar or galactic in origin, may influence the troposphere and stratosphere through a range of different mechanisms, each probably contributing a small amount. Some of the suggested processes potentially acting over a wide spatial area in the troposphere include enhanced scavenging of charged aerosol particles, modification of droplet or droplet-droplet behavior by charging, and the direct absorption of infra-red radiation by the bending and stretching of hydrogen bonds inside atmospheric cluster-ions.

As well as reviewing the proposed mechanisms by which energetic particles modulate atmospheric properties, we will also discuss new instrumentation for measurement of energetic particles in the atmosphere.