



Pre-Cloud Condensation Nuclei Cluster Formation by Ion-Mediated Nucleation from Solar Energetic Particles: Example of the 2005 January 20 Ground Level Enhancement

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The nucleation process is the first step in creating cloud condensation nuclei (CCN). There was a report on cosmic rays and cloud cover correlation in 2007 but whether the correlation is true remains a debated issue. CERN has initiated the CLOUD project to study the effects of nucleation. Fangqun Yu also reported a parameterization scheme for including the effect of atmospheric ionization on the generation of pre-CCN ion clusters.

Our study explored past literature and used existing parameterization, measurement campaign datasets and ionization simulations to set an upper limit on the contribution of cosmic rays to the nucleation process. We have chosen the Jan 2005 solar energetic particle (SEP) event as the strongest SEP event in the past 60 years. We also chose to investigate the effect at Antarctica where the cosmic ray intensity is most prominent, and considered the actual atmospheric variables there. We calculate the effects of the background galactic cosmic rays (GCR) and relativistic solar particles in comparison with other nucleation sources such as stochastic heterogeneous nucleation particles.