

Using Ground-based Lightning Observations to Study Global Climate Change

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In recent years much attention has been given to the topic of global warming and future climate change. One aspect of future climate change is related to thunderstorms and severe weather. How will climate change impact thunderstorm frequency and distribution? The majority of thunderstorms are located in the tropics where few local observations are made. Using ground-based electromagnetic methods in the extremely low frequency (ELF) range it is possible to continuously track global and regional lightning activity from a few stations at low cost, little maintenance, and with absolutely calibrated measurements. Hence, ELF methods of tracking thunderstorms may provide valuable information regarding the Earth's changing climate. In addition to tracking lightning and thunderstorms, Williams (1992) and Price (2000) have shown that lightning activity is closely linked to important climate parameters such as surface temperature and upper tropospheric water vapor. Hence ELF methods of tracking tropical thunderstorms may provide additional information related to the Earth's changing atmospheric temperatures, convection, and water vapor in the upper troposphere. Recently discovered sprites and elves are also related to thunderstorms, and are related to ELF transient signals observed at ground stations. Monitoring ELF transients and sprites may also provide important information regarding climate variability.