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#AzadiKaAmritMahotsav

Lecture Series on

Cloud and Precipitation Physics and Dynamics

MINISTRY OF EARTH SCIENCES

Where are the lightning hotspots on Earth?

Dr. Rachel Albrecht

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http://labnuvens.iag.usp.br/

About the speaker:

Dr. Rachel Albrecht is a professor at the Department of Atmospheric Sciences at the University of São Paulo where she leads a group of graduate and undergraduate students in cloud physics and atmospheric electricity. Her research and teaching interests include the physics of lightning and precipitation, cloud-aerosol-precipitation interactions in deep convection, and remote sensing of precipitation and lightning to improve short-term forecasting of severe storms. She has participated and led several field experiments in Brazil to investigate microphysics of clouds and rain, physics of thunderstorms and lightning, and variability of storms. She is member of the GOES-R GLM (Geostationary Mapper) Science Team, co-chair of the WMO Nowcasting and Mesoscale Research Working Group and member of the International Commission on Clouds and Precipitation (ICCP). Prior to joining the University of São Paulo in 2014, she was Research Associate at NOAA's Cooperative Institute for Climate and Satellites (CICS) at the University of Maryland, USA, and Scientific Researcher at the Center for Weather Forecasting and Climate Studies (CPTEC) at the National Institute for Space Research (INPE), Brazil.

Abstract:

Previous total lightning climatology studies using Tropical Rainfall Measuring Mission (TRMM) Lightning Imaging Sensor (LIS) observations were reported at coarse resolution (0.5°) and employed significant spatial and temporal smoothing to account for sampling limitations of TRMM's tropical to subtropical low-Earth-orbit coverage. The analysis reported here uses a 16-yr reprocessed dataset to create a very high-resolution (0.1°) climatology with no further spatial averaging. This analysis reveals that Earth's principal lightning hotspot occurs over Lake Maracaibo in Venezuela, while the highest flash rate density hotspot previously found at the lower 0.5°-resolution sampling was found in the Congo basin in Africa. Lake Maracaibo's pattern of convergent windflow (mountain–valley, lake, and sea breezes) occurs over the warm lake waters nearly year-round and contributes to nocturnal thunderstorm development 297 days per year on average. These thunderstorms are very localized, and their persistent development anchored in one location accounts for the high flash rate density. Several other inland lakes with similar conditions, that is, deep nocturnal convection driven by locally forced convergent flow over a warm lake surface, are also revealed.

Africa is the continent with the most lightning hotspots, followed by Asia, South America, North America, and Australia. A climatological map of the local hour of maximum flash rate density reveals that most oceanic total lightning maxima are related to nocturnal thunderstorms, while continental lightning tends to occur during the afternoon. Most of the principal continental maxima are located near major mountain ranges, revealing the importance of local topography in thunderstorm development. are also revealed.

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YouTube https://youtu.be/-eJ8Lcyrtlw