Dr. Ehsan Erfani is an Assistant Research Professor in the Division of Atmospheric Sciences at the Desert Research Institute (DRI). His research interests include cloud physics, aerosol-cloud interactions, and climate dynamics. He has expertise in a variety of methodologies including advanced data analysis, satellite remote sensing, global climate models (GCM), and large-eddy simulations (LES).

The title of his current project related to NV NASA EPSCoR is “investigating the relationship between El Niño Southern Oscillation and cirrus clouds”. El Niño Southern Oscillation (ENSO) is perhaps the most important large-scale oscillation that impacts global circulation by changing various environmental features like precipitation, temperature, clouds, and fire in many regions, including the Western U.S. One of these environmental features is cirrus clouds which play a key role in Earth's radiation budget since they cover about 20-30 % of the Earth's surface on average and about 80% over the tropics. A few studies have suggested that ENSO might modify cirrus clouds, but the extent and mechanisms of these modifications are uncertain. The processes involved in cirrus cloud formation span a wide range of spatial and temporal scales, from ice microphysics to planetary wave dynamics. This complexity has left many important questions unanswered, and therefore, it is necessary to investigate the mechanisms involved. The goal of this project is to study the link between cirrus clouds and ENSO in order to better understand the role of large-scale controlling factors. To accomplish this goal, various NASA reanalysis and satellite datasets, including meteorological and cloud properties, will be acquired for the period 2000-2024 over the Pacific Ocean and Western U.S. Statistical analysis will be used to group the data based on three ENSO phases (El Niño, La Niña, and neutral). Cloud and meteorological variables will be studied in each group and will be compared to find mechanisms that explain the relationship between cirrus clouds and ENSO phases and the role of atmospheric features (e.g., convection, jet stream, and tropospheric moisture and heating) that impact this relationship. The findings will help us understand the current climate and will provide insights for future studies in improving climate predictions. This project contributes to NASA and NSHE missions by gaining insights into the Earth's climate and addressing extreme weather and climate events.