

The RAL Seminar Series



NCAR

Orographic Precipitation Gradients, Barrier Jet Heights, and Streamflow in the Northern Sierra Nevada

by

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**Foothills Lab Building 2, Room 1001
1:30 p.m.**

The rate of precipitation increase with elevation, termed the orographic precipitation gradient (OPG), is critically important for hydrologic forecasting in mountain basins that receive both rain and snow. Here we examine how well the following are able to predict the OPG and how it changes between storms and years: (1) a linear model of orographic precipitation forced by upstream radiosonde data, (2) monthly PRISM precipitation data, and (3) seven years of hourly wind profiler data used to identify characteristics of the Sierra barrier jet (BJ). These are compared against 124 daily-resolution (four of which also had quality-controlled, hourly resolution) precipitation gage records in the northern Sierra Nevada. All methods represent the OPG well in the mean and during a year when less than 30% of the precipitation occurred on days with BJs. However, the linear model and PRISM do not adequately capture annual variations in the OPG during years when more than 70% of the precipitation occurred on days with BJs. Throughout all years, wind profiler data indicating the height of the BJ provided additional, and necessary, information. The OPG is negatively correlated with the height of the BJ. The BJ height is lower, and hence, the OPG greater, when the westerly winds are stronger, with more vertical wind shear. These westerly storms result in greater increases of precipitation with elevation, which act to increase snow storage in most storms but also to increase storm runoff during warmer-than-average storms.