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Design of a probabilistic wildfire alert system for Chile

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During the past 50 years over 200,000 wildfires have burned nearly 2.3 million hectares in Chile, leading to significant economic consequences. To improve wildfire warning capabilities, statistical models have been developed by the University of Chile for 15 different geographic regions of the country to quantify wildfire risk based on a set of specific meteorological variables (air temperature, relative humidity, wind speed, accumulated precipitation, and time of year). Currently, the warning system uses data input from ground-based weather stations and alerts are issued one day ahead.

This project improves upon the current system by using variables from ensemble weather prediction datasets (TIGGE archive from ECMWF) as input to the wildfire risk model. This allows development of a probabilistic alert system that takes into account uncertainties in the specific meteorological forecast variables used in the wildfire risk model. This also allows the wildfire risk index to be calculated up to seven days ahead. The integration of the statistical wildfire risk model with the ensemble weather prediction system provides additional information about uncertainty to improve resource allocation decisions.

The new system is evaluated using MODIS satellite wildfire detection datasets from 2008-2015 for each of the 15 geographic wildfire risk regions. The prototype alert system is then compared to alerts made using forecast variables from the operational ensemble weather prediction system used by the Chilean Meteorological Service. Finally, a novel method to update the wildfire risk statistical model parameters in real time based on observed spatial and temporal wildfire patterns will be presented.