Improving the Prediction of Wildfire Potential in Boreal Alaska with Satellite Imaging Radar

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Wildfire is a natural successional process in boreal forests of Alaska, however it sometimes presents a natural hazard when human lives and property are at risk. In Alaska, the Canadian Forest Fire Danger Rating System is used for assessment of the potential for wildfire (Fire Weather Index) and fire behavior prediction. Although this system is essential to current practices and wildfire management, it is not without its shortcomings. One issue with the Fire Weather Index System is the initialization of some of the codes and indices making up the system in early spring The system is completely weather- based, consisting of a daily accounting of weather parameters from spring to fall. Default start-up values are not always appropriate (due to high end of season drought and low winter precipitation) and the information on which to base that decision (over-winter precipitation from RAWS) is often not available. This is particularly an issue for the drought code (DC) which is an estimate of moisture in the deeper compact organic soil layers of the ground, and which has a 52 day lag**.** Another problem with the DC in Alaska is that of mid-summer variations in measured moisture values within permafrost regions that are not accounted for in the FWI system. Melting of some of the frozen layers later in the summer may be a cause of increased moisture not accounted for in the weather-based system. We are working to develop ways to improve the system. In our early work, c-band (5.7 cm wavelength) satellite radar backscatter from a burn scar in Tok Alaska was correlated to the FWI system's DC calculated at Tok Area Forestry (Bourgeau-Chavez et al. 1999). This relationship exists because the radar is sensitive to the moisture of the features being imaged, and because the forest canopy has been removed exposing the ground layer for measurement by the satellite-based radar. In our current work we extended the original relationship to include data from burn scars at different locations around the interior of Alaska, and to cover a range of years post-burn. We found that we could combine data from multiple years and multiple burned areas to develop a generic algorithm relating backscatter to DC. Using this generic algorithm, we can then use backscatter from a burned area in spring to initialize the DC weather-based system. By initialing the code in the spring and then calibrating throughout the season with backscatter-derived DC values, we can improve the current system. Since fire scars exist intermittently across the entire interior landscape, this procedure is plausible for operational use. It does not require georectification of imagery, only knowledge of the general area, comparison to fire scar maps and knowledge of weather-station locations. It is a quick and easy method for initializing the DC, and also calibrating it throughout the season. Further, these new data points derived from imaging radar can be used as additional point sources of information across the landscape.

Literature Cited

Bourgeau-Chavez, L.L., E.S. Kasischke, and M.D. Rutherford, 1999. Evaluation of ERS SAR data for prediction of fire danger in a boreal region. International Journal of Wildland Fire Vol. 9(3):183-194.