

Is Northern Hemisphere Snow Cover an Early Indicator of Summertime Temperatures? Remote Sensing Applications and the Implications for US Agriculture

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The anchor in the agricultural sector of the United States' economy is California, with over 26 million acres of farmland, over 36 billion pounds of dairy production, and the top ranking state in the US in terms of the total value of agricultural products. As such, any early warning indicator of weather patterns that may affect agricultural production can have significant value, from a financial perspective for farmers to a supply planning perspective for the consumer. Many sophisticated forecasting tools are available from a variety of public, university or private services; however we can look at the areal extent of snow cover as derived from satellites as an important physical parameter to consider when developing seasonal outlooks and point forecasts for agricultural purposes. Estimates of snow cover on daily, weekly, monthly and seasonal timeframes are available through the NOAA National Environmental Satellite Data and Information Services (NESDIS), and quantified at the Rutgers University Global Snow Lab (GSL). As weather risk management tools are being used more often to protect farmers against the vagaries of adverse weather, remotely sensed satellite data is becoming an increasingly valuable diagnostic tool in assisting this effort. Preliminary research shows that there is a very strong correlation between both Northern Hemisphere and North American snow cover, and average spring/summer temperatures in California ($R\text{-sq.} >0.90$). I will discuss some of the relationships between the extent of polar snow cover and CA temperatures, discuss the potential value of this information with respect to certain crops and their growing cycles, and also review the associations with rainfall. Further, once some general relationships between satellite derived snow cover and the lag in surface temperature are confirmed, I will start to assess how large scale processes such as the El Nino/Southern Oscillation can affect targeted regions and/or crops in different parts of the state. Finally, I will talk about how a simple methodology can be developed with this data source, and taken forward to provide a first step in assessing seasonal climate related risk.