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Influence of Climate Shifts on Decadal Variations of Surface Solar Radiation in Alaska

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It has been known from past studies that the Pacific Decadal Oscillation (PDO) shifted in 1976 and a new climate regime occurred that produced changes in clouds, temperature, and precipitation in the North Pacific including Alaska. These changes include a warming of the mean annual and seasonal temperatures and associated increases in cloud cover and precipitation. In this study, this climate shift is examined with regards to the variations in surface solar radiation before and after 1976. The results show greatest changes occurring in the southeast region in winter during 1961-1975 with significant trends of 1.67% yr-1 before the shift and -1.07% yr-1 during 1977-1991 after the shift. In addition, the PDO and the solar radiation series show common changes around 1989 and 1998. Thus, these two variables are compared to assess the strength of their relationship. The results show a high correlation with a maximum found in winter in Anchorage (south-central region) and less agreement in other seasons. Also, the Pacific North American (PNA) circulation pattern is correlated with the solar radiation, which shows an even stronger connection during winter in Anchorage. Cloud cover changes are also evaluated which display the same behavior as in the downward surface shortwave radiation (DSW). With past studies attributing the changes in decadal surface solar radiation to variations in aerosol concentrations, the main cause of changes in Alaska are found to be due to circulation patterns and associated cloud cover changes.