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Snow Cover Extent Mapping Based on Dual-polarimetric Sentinel-1 SAR Data

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Snow cover extent (SCE) acts as an important parameter in global energy balance and cryospheric components' interaction as well as it significantly dominates the hydrological behavior of mountainous regions. Over the past years, shrinking of SCE due to climate change has been observed. This fundamentally changes the amount, distribution, and seasonality of snow-dominated river regimes. Although, conventional optical-based spaceborne sensors (such as Landsat) have shown high accuracy of mapping SCE, the existence of clouds and polar darkness decreases data availability. As a result, synthetic aperture radar (SAR) could be applied thanks to its day-and-night as well as all-weather sensing possibility. However, previous studies mapping SCE with SAR data usually utilize intensity information of SAR and ignore SAR's rich phase information. Therefore, we explore the potential of mapping SCE for dry and wet snow with backscatter intensity thresholding, interferometric SAR (InSAR), and polarimetric SAR (PolSAR) techniques. Additionally, we increase our classification accuracy by including geomorphological factors as well as vegetation indexes. The SAR derived SCE is validated with Landsat-based SCE and meteorological snow depth records for five mountainous regions. The applicability of our developed methodology is confirmed by an average overall accuracy and F-measure better than 85% for all land cover classes.