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Near real time monitoring of Prairie Pothole surface water area

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Closed topographic depressions are common in the glaciated Prairies of North America and an important water storage element in the regional hydrological system. Given the large number of such features across the northern Prairie region, it is challenging to provide near-real-time monitoring of the spatial and temporal variation in water surface area over the course of the year. Satellite remote sensing is the only practical approach to mapping the surface water area of prairie potholes on an ongoing and cost-effective basis. Optical satellite imagery is able to detect surface water, but only under cloud free conditions. This is a strong limitation for operational monitoring of surface water variability. However, RADARSAT-2 as an active sensor has the ability to provide data for surface waterbody detection that can overcome the limitations of optical sensors. A threshold based procedure was developed in this research using Fine-Wide beam mode (F0W3) to delineate the extent of surface water areas in St. Denis study basin, Saskatchewan, Canada. The FOW3 thresholding results yielded a higher number of apparent water surfaces than visible in SPOT-6 optical imagery of comparable resolution acquired the same day. TOPAZ software was used to determine the maximum possible extent of water ponding on the surface by analyzing high resolution LiDAR data. Removing FOW3-detected water bodies that were outside the depressions mapped using TOPAZ gave improved results. Comparing the TOPAZ-masked FOW3 results to the SPOT-6 optical water surface map gave an overall accuracy and Kappa index for surface water areas > 0.5ha of 91% and 0.84, respectively.