2021 – DataFEWSion Symposium – Proposed Abstract for Poster or Oral Presentation

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Validation of Three Microwave Satellite and Three Reanalysis Soil Moisture Products in the U.S. Corn Belt Considering the Periods when Farmers Make Key Management Decisions Driven by Crop Development Stages.

Evaluating soil moisture information should consider when key crop development stages occur and ultimately when decisions based upon soil moisture status must be made by farmers. Therefore, we assessed the performance of three microwave satellites and three reanalysis models in the U.S. Corn Belt in the context of agricultural management. We considered the following soil moisture products: SMAP, SMOS, and ASCAT/METOP satellites; and MERRA-2, NARR, and WEPP reanalysis models. Estimated thermal time and crop progress reports from the USDA NASS were used to define critical transition periods of crop growth and management decisions for the validation process. Contrary to calendar timelines, like annual or monthly segments, these key events separate the growing season into four irregular segments: pre-planting, when soil moisture should be within an optimal range for any management practices; active, when field trafficability is needed for management practices during initial growth; minimal, when little to no management practices occur during later crop development; and post-harvest when tillage and or fertilizer application for the next growing season often occurs. The critical validation metrics used were bias, RMSE, and unRMSE. The validation process utilized 20 in-situ volumetric water content measurements between 2016 to 2020 at a depth of 5 cm in the South Fork of the Iowa River, Iowa, a SMAP Core Validation Site. We found that, on

average, the two passive satellite products were dry compared to in-situ observations for all validation segments. On the contrary, the active satellite and reanalysis model products were wetter than the in-situ observations.