AQRP Monthly Technical Report

PROJECT TITLE	Use of satellite data to improve specifications of land surface parameters	PROJECT # 14-022	14-022
PROJECT PARTICIPANTS	R. McNider, Y. Wu, K.Doty, Pius Lee, Min Huang	DATE SUBMITTED	8/11/2015
REPORTING PERIOD	**From:** July 1, 2015 **To:** July 31, 2015	REPORT #	7

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task

Task 1 Insolation Impacts: As indicated in the last monthly report given the small errors we will use the satellite insolation products unadjusted. We have, however, begun to explore the difference in clear sky and the insolation product as a further technique of cloud masking in the use of skin temperatures.

Task 2 Diagnosed Skin Temperature in the WRF Pleim-Xiu Scheme: No further activity this month. The deliverable report on the documentation and implementation of a diagnosed skin temperature in the Pleim-Xiu scheme was delivered April 9, 2015.

Task 3 Evaluation of Satellite Skin Temperature Products: As noted in previous reports we had to discontinue use of the NOAA GSIP product because of erroneous temperatures in the west. We have, however, received an ALEXI skin temperature products from Chris Hain of NOAA for the entire month of September. We are using it in the assimilation runs. Min Huang, NOAA affiliate has also submitted a manuscript to J. Geophys. Res. outlining initial comparisons of model results to Discovery AQ aircraft and satellite observed skin temperatures.

Task 4. Assimilation of Skin Temperatures in the Pleim-Xiu scheme. As reported in our July 15 (29) Deliverable report we have made the first runs of using satellite surface skin temperatures to adjust soil moisture. We have developed a technique which diagnoses a skin temperature consistent with the surface fluxes in the PX scheme. We have created techniques within the WRF framework which allow us to bring in satellite skin temperature data to carry out the nudging of soil moisture using satellite skin temperatures as opposed the NWS soil moisture nudging in the original PX scheme. However, our first results do not provide the level of improvement as was seen in the McNider et al 1994 technique. We believe part of this is due to the erroneous vegetation fraction produced by the seasonal adjustment in the PX scheme. We have talked with Jon Pleim about this and they recognize issues with the specification of vegetation fraction and LAI. They are considering alternatives such as MODIS vegetation

fraction and MODIS LAI. Since this report we have carried out new control and assimilation runs that use the unadjusted USGS vegetation fractions. The control run also turned off the NWS 2 meter nudging option. We also decided to use temporarily the absolute difference in skin temperature to do the nudging rather than a quasi-observed field. The initial results from this run are highly encouraging with most areas of the domain showing improvement when the observed skin temperature is the metric.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments – As mentioned above we have solved the skin temperature data problem which we reported last time as an issue. The finding of the erroneous vegetation fraction in the Pleim-Xiu (PX) was unexpected and caused some delay but the unadjusted USGS vegetation fraction appears to work satisfactorily. We do see some cloud contamination issues in the afternoon skin temperatures which we use for validation. We are applying additional tools for cloud masking (see Task 1 above).

Goals and Anticipated Issues for the Succeeding Reporting Period: Though this was an optional task we hoped to also attempt to adjust the surface heat resistance term (Ct) in PX scheme following McNider et al. 2005. We have encountered some compiler issues as we have implemented this code and are troubleshooting this now.

Detailed Analysis of the Progress of the Task Order to Date
We believe we are on basically on schedule for the project for completing and testing the skin temperature moisture nudging. Full completion of the optional adjustment of heat resistance coefficient may be delayed if we cannot solve the compiler issue.

Submitted to AQRP by:

Principal Investigator: Richard T. McNider