

## FY15 NM WRI Research Progress Report Form

1. **Project Title:** New Mexico statewide water assessment: Comparison of operational precipitation and evapotranspiration products for statewide water assessment.
2. **Investigators (names, university/agency):** Jan M.H. Hendrickx, New Mexico Tech and Thomas Schmugge, New Mexico State University. **Other Researchers:** Dan Cadol, New Mexico Tech and Ken Peterson, NM Water Resources Research Institute.
3. **Brief description of project, research objectives, and impacts on New Mexico (provide performance measures and outcomes):** The economic vitality of New Mexico depends on its water availability, but no one knows exactly where, when, and how much water is available in the state. Precipitation and evapotranspiration are the major components of a water balance equation. We have identified five precipitation and three evapotranspiration products, currently available over New Mexico. The research objectives for this project are:
  1. We will compare and contrast each of these products spatially and statistically.
  2. We will validate the products against reliable measurements: precipitation products against precipitation gauges and experimental ranges and evapotranspiration against METRIC model ET maps.
  3. We will validate two chosen products for assessment of reference ET to be used to fill in null values in existing ET products.
  4. We will produce statewide precipitation and evapotranspiration products for New Mexico with a quality assessment and a plan for how to improve these products at the proper spatial and temporal scales.
4. **Brief description of methodology:** Each research objective will be completed per phase:
  - Phase 1: Obtain and compile all data and base literature for each product model. Display all data across each year available for the entire state. Produce tabular itemizations for basic statistical analysis for the entire state, for each year, for each model. Produce comparison graphs, histograms, and spatial displays for each model.
  - Phase 2: Obtain and compile all data and base literature for each validation model or dataset. Produce correlation scatter plots that compare each validation product with each precipitation and evapotranspiration product. Establish one or two precipitation and evapotranspiration products to focus on as key products and require less model manipulation for further verification.
  - Phase 3: Validate two existing methods for assessment of the reference ET for the New Mexico environment. One is a remote sensing method, the other consists of calculating the reference ET from NLDAS (North American Land Data Assimilation Systems) data following the standard method of the American Society of Civil Engineers. The reference ET is needed for calculation of the reference ETr fraction (ETrF) that is needed to fill the missing data in the existing ET products. The ETrF is a steady variable that allows reliable interpolation of ET values where missing data occur.

- Phase 4: Compile all precipitation and evapotranspiration data into a geodatabase and set of map documents at a spatial and temporal scale that will allow them to be combined with other water balance component data. Provide all pertinent metadata.

- 5. Brief description of results to date and work remaining:** We have completed phase one and have begun to work on phase two. Phase one resulted in spatial maps, graphs, quantitative statistics, and histograms for each of the eight models, for whole years, for the entire state. Phase two has produced correlation maps and graphs for the Jornada Experimental Range against a covering subset from the TRMM and PRISM models.

Since the September report, we have identified additional sources of higher elevation rain gauge data for comparison with the precipitation estimates. The comparison of all the precipitation models (PRISM, CHIRPS, AHPS, TRMM and PERSIANN) with the Jornada rain gauges has been completed and the agreement is very good for PRISM and satisfactory the other with the exception of PERSIANN which substantially overestimated the precipitation. We have obtained some MATRIX ET data from Dr. Hendrickx on NM Tech for comparison with the ET models. Field observations of ET at several locations have been found.

- 6. Student participation - List all students participating in the project, their classification level (undergraduate, master's, Ph.D., post doc) and their field of study (degree major):** Steve Walker, Master of Applied Geography; Ian Hewitt, Master of Water Science and Management; Robert Sabie, Master of Applied Geography; Abebe Besha, Ph.D. of Water Science and Management; Reid Brown, Master of Hydrology.

- 7. Provide special recognition awards or notable achievements as a result of the research. Include publications in progress (all published work supported wholly or in part of NM WRRI must bear an acknowledgment of support):**

- We submitted an abstract to the 2014 Fall meeting of the American Geophysical Union (AGU).

- 8. Include references as needed (limit to one additional page):**

- 9. Provide a few sentences on progress toward uploading data to a common/standardized platform, if applicable:** We are working to obtain approval to construct a server that will become a central repository for data collected for this and all research leading to the calculation of a statewide water assessment for New Mexico. We are developing the online structure that will allow these data to be uploaded, downloaded, and displayed to other researchers and the public through maps, graphs, and tables.

- 10. Provide two PP slides that provide summary information on your project appropriate for viewing by state legislators:**