**WDC37 (WERA-102)**

**2016 Annual Meeting Minutes**

**Climate data and analyses for applications in agriculture and natural resources**

**Meeting Chair: David Dubois**

**Vice-Chair: Jama Hamel**

**Wooton Hall, New Mexico State University, Las Cruces, New Mexico**

**September 13-14, 2016**

Participants

Ed Martin (U of A), Dave Dubois (NMSU), Mike Crimmins (U of A), Connie Maxwell (USDA), Julian Reyes(USDA), Jama Hamel (USBR), Emile Elias (USDA-ARS), Al Rango (USDA-ARS), Darren Knuteson (USBR), Leopoldo Rocca (India/Peru), Chris Daly (OSU), Nancy Selover (ASU), Nolan Doesken (CSU), Kelly Redmond (WRCC-DRI)

Tuesday, September 13, 2016

Dave spoke about the group’s mission and the possibility of a joint project to promote group collaboration and possibly write a grant with members. Introduced Ed Martin as the new faculty advisor, introduced the group. Appointed Jama Hamel as chair for 2017 with a joint meeting with WERA-1022, Emile Elias was appointed as vice-chair with the 2018 meeting possibly hosted in Davis, California for 2018.

Emile Elias, USDA-ARS presented on the “Role of the USDA Southwest Climate Hub,” located in the southwestern states, CA, AZ, NM, NV,UT, Selected projects include Climate Hubs Toolshed, webpage related products, vulnerability assessments with a climate change special issue, education module on climate change and water (junior high and high school level), county level projections of temperature and precipitation. Partnered with regional extension, providing small grants to Cooperative Extension, with workshop to initiate discussions of a regional approach to climate change. Current projects and proposals include precipitation trends, groundwater shortage vulnerability mapping, Vesicular Stomatitis Virus (climate change related virus affecting cattle and horses) grand challenge, new version of SRM, Southwest Climate Conference, and Climate Master’s Grant. Climate Hub research teams include representation form water resources, crops, livestock and climate science. Priority areas include drought outlook, water availability, extreme events, etc. Recommendations include work with advisors, provide farm scale data, improve perceptions of accuracy for short-term forecasts, provide long-term climate information to forest advisors and farmers and ranchers, host continuing education programs for advisors, agreement about human contribution to CC not necessary, and outreach should focus on adaptation options with mitigation benefits. Group discussion on further collaboration. USDA plans to apply for NRCS grants and NIFA funding to provide research and coordinated use and information.

Jama Hamel, USBR, presented on the AgriMet program and gave a Pisces demonstration.

Chris Daly, Oregon State University, PRISM Update. No university funding, everything comes from public funds. Many federal agencies have collaborated on products including PRISM Climate mapping, Bio-Fuel resource mapping, climatological guidelines, and weather data via web portal. Plant hardiness zone map is likely the most well-used climate map in the world with about 500,000 visits per month. NOAA Atlas 14 partners with PRISM on precipitation extremes. Public PRISM data portal, data explorer, provides data information for gridded data set. PRISM Drought Indicator (public portal) shows precipitation % of normal, among other things, can customize to requirements. Crop insurance portal requires user account for crop insurance adjusters for claims adjustments and research, satisfying RMA weather documentation requirements. Recent conditions shows actuals and anomalies from normal. Summary Assessment provides a statistical analysis of risk for crops. Can pull in detail data and export, reports are also easily pulled in based on various methods to determine location. Short-term conditions report is a new method for looking at recent conditions. Severe weather uses a map display with NOAA radar-based maximum hail size, PRISM tmax/tmin (daily), with ground obs from CoCoRahs and NWS storm reports. Contains normal, monthly and daily for precip, temp, mean dew point and VPD, with future plans to incorporate solar radiation and wind speed to calculate ET. 4-km resolution freely available via web, 800-m for a fee via hard drive. Many different networks used with station listing in every grid package. Lack mountain humidity data, RAWS is the highest elevation large, routine network. Temperature inversions make it difficult to extrapolate low-elevation humidity data to higher elevations. Ag based stations create an issue with humidity measurements as they are located in irrigated areas and show bias. Hillslopes are under-represented, stations installed on steep, open slope above valley scale inversion, and compared to PRISM data. Found high thermal loading, elevated Tmax with little cold air pooling, elevated Tmin. Snotel sites are mostly used and are located in the forest canopy on a flat slope resulting in a cool bias. Adding new networks takes a lot of effort, about 1.5 FTE devoted to station data ingest/processing. Need to set priorities based on amount of new information, quality, accessibility and stability of the data, as well as the interest of funders. PRISM provides USDS’s official climate maps, and the primary source for federal crop insurance program.

Mike Anderson, California DWR, CoCoRahs has 1480 observers in 55 of 58 counties with 250 (dry) to 600 (wet) reports per day. US Drought monitor shows California in an Exceptional Drought. 2013, 2014 and 2015 temp vs precip is comparable or exceeds 1934 for the Sacramento area. Coastal regions show similar trends, although precip did not bounce back as much. Snow-water equivalent maps show significant difference between the 15 year model mean on March 29 (mean peak) and the same day in 2015 which was 5% of normal. Sierra average minimum temperature vs April 1 Snowpack percentage of average indicates 2013, 2014 and 2015 are some of the worst on record, with 2015 being the worst by far, surpassing end of century climate change projections. NOAA predicted a strong El Nino and California’s water systems solved, resulting in massive damage to public perception. Took 6 of the strongest El Nino signatures and looked at possible outcomes, some wet, some dry and variations, spatially variable. Models suggested California would be very wet Dec-Feb. Started out good, set a new weekly record in November, sea temps had a pulse, then died. February was one of the worst on record, March had a large storm with flooding in San Diego then the jet stream completely broke up. Oct-Apr 2015-2016 temperatures still high and in top portion, however no longer in the record dry region, spatially variable. Current precip totals above average, however runoff did not start tracking normal until January because it was so dry. Into January, Oroville reservoir levels were not good, then in January, gained ground and caught up (north of Delta). San Louis reservoir (south of Delta), 2016 was lower than 2015 due to timing of atmospheric river and fisheries rules, therefore had to divert river, having no effect of reservoir storage levels. Current drought monitor conditions still show a large exceptional drought signature in much of the central portions of the state with the entire state being in some sort of drought conditions. La Nina signature possibly setting up, could be good or bad for California depending on where the high pressure sets up and the variable pacific jet stream location. Since mid-July, above-average heights and temps have prevailed over eastern N America, while mostly below-average heights and temperatures have persisted over the western contiguous U.S. Quite a few retirements from California may pose an issue in the year to come if California experiences flooding. Decadal scale precipitation variability tied to atmospheric river landfall variability, important AR characteristics include freezing elevation, moisture flux and duration.

Dave Dubois, New Mexico State. Activities include service to state, region, community and campus with monitoring networks, drought monitoring; contribute to outlooks, workshops and briefings, and teaching/mentoring; perform outreach and climate literacy via workshops on climate and drought, and social media; and research. Monitoring networks include the NM Agricultural Meteorological network, former USRCRN, viticulture network, outreach (low cost) network, CoCoRahs and environmental monitoring network design. NM Agricultural Met Stations 10 active stations located at NMSU Ag Science Centers, 3 permanently closed with 4 coming back online. Most stations located over grass, 3m winds, 2m temperature with 5 minute data. New/upgraded stations for USBR project. Took over fromer USRCRN network stations in a joint effort between NMSI, BLM, USFS, cities and Park Service in 2014-2015, 16 total (5 NPS). Viticulture program at the Department of Extension Plant Sciences, with 11 vineyards supported using Davis VantagePro2, Raspberry Pi and wifi, telemetered to main campus on 5 minute to hourly intervals. NM Low Cost WxNet supports outreach to schools, fire station and city dust control project involving students and the same infrastructure as the viticulture network. CoCoRahs has observers in every county but not reporting every day, with the most (470) reports on 9/7/2016. Outreach and climate literacy activities consist of on campus activities such as teaching, sustainability council, and invited speakers; community projects with schools, WeatherFest, environmental fairs, CoCoRahs, Master Gardeners, and Museum Nat’l History; and global connections. Social media has been successful for outreach using YouTube and Twitter with students and community. Climate Data Hackathon is a 2 day session focused on tool training, solving a local issue and communication, using large climate data sets. Current research includes air quality and met monitoring, inventories with NM Dept of Health; dust emissions and air quality monitoring with NM Environment Dept; dust mitigation and monitoring network design for NM & NV Dept of Transportation; TAMU/Univ of Chihuahua rangeland projects; and El Paso MPO. Time lapse camera network captures extreme events, taking a picture every 5 seconds with 1+ year of monitoring. In the future plan to focus on collaboration of data products, Ag met network and CoCoRahs with hub, extension and industry.

Nolan Doeskan, CSU. The Colorado Climate Center provides valuable climate expertise to the residents of the state through climate monitoring, services and research. Until the late 1970’s, NWS was the only source for climate data and USDA for snow. Some NWS records go back to the 1800’s. USDA had an extensive Snowpack Telemetry Network. Remote Automatic Weather Stations (RAWS), a USFS/BLM network began in the mid 1980’s and now provides a decent climate network. Fort Collins weather station is being encroached upon and become an island while trees grow and wind decreases. Colorado Agricultural Meteorological Network (CoAgMet), only a handful are pure dryland, most are irrigated or mostly irrigated. CoAgMet data is not primarily used for irrigation scheduling and ET. CoCoRahs is widely used across the state with nearly 2500 rain gauge measurements during the extreme event during Sept 2013. Gauges plus calibrated rainfall provided one of the most comprehensive rainfall measurement ever. CoCoRahs is represented in every state, with a large percentage of one county in Kansas reporting every day. NEXRAD (radar) coverage below 10,000 feet nonexistent in the Four Corners area, which includes Lake Powell. More than a quarter million people reside in the area with no coverage, with many transportation corridors, a couple different entities, including Colorado, are trying to pool resources to cover this gap. Future projects include Colorado wine grape expansion; NW Colorado lysimeter projects; USBR CoAgMet expansion; citizen science soil moisture monitoring; CoCoRahs in the Caribbean and Canada (French option); USFS Rio Grande National Forest climate description and trends; NIDIS drought early warning transitioning to Intermountain West; climate Smart Ag Initiative within extension; hiring new staff; and various unfunded, fun projects. Reflections motivated by the recent 40th anniversary of the big Thompson Flood of 1976 with very limited, hard copy and delayed data with hand drawn climate maps. Climatology was unpopular and jobs were scarce with an appearance of a cooling earth with many people reading newspapers and press releases got attention.

Mike Crimmins, University of Arizona, “Climate Science Extension for Arizona ranchers and range managers.” Arizona five C’s – Copper, Cattle, Citrus, Cotton and Climate. 73% of AZ land area is grazing land (mostly public) with $5.2 billion cattle operations and $800 million in calf and cattle sales in 2011. AZ has a seasonal-transitional climate with high inter-annual variability (ENSO), high spatial variability (topography, convective t’storms) with grazing systems vulnerable to that variability. Co-developing approaches to improve planning for drought on public lands. NOAA-SARP/NIDIS funded project with US Forest Service, Gila County Cattlegrowers and National Drought Mitigation Center as partners. Managing grazing on public lands requires close coordination and cooperation between USFS and livestock producers. Drought events can cause conflict with better planning and monitoring may reduce risk of conflicts and improve cooperation. Interdisciplinary team with social scientists, range scientists and climatologists, with preliminary surveys provided needs. Developed training materials and tools, surveys indicated a general interest in learning more about drought indices, with USFS using a drought trigger threshold of (Standard Precipitation Index) SPI<1, developed an online tool with dashboard that included 5 different products for ranchers and USFS employees, SPI Tool. Small group exercises walk users through the tool and how to interpret results, uses PRISM maps and historical trends. Held training workshops to go through the exercises and results. Precipitation monitoring is key management tool, some ranchers have them, although they aren’t spatially representative and often only read once per year. Would like to increase rain gauge density to have a rain gauge in every pasture and allotment. Encouraging and supporting the installation of rain gauges in al key monitoring areas (public and private). Project began in 2016 with a working group including Gila County Catlegrowers, USFS, AZ Game/Fish and BLM with a series of three workshops to get the project up and running. Best practices include more rain gauges with more frequent readings at intervals that provide valuable information (tank vs. grass rains). Need to find a simple rain gauge that is durable, cow proof and weather resistant. Made a batch of homemade gauges with alterations based on feedback with a $25 price point. Some are co-located with tipping buckets and running tests to determine correlations. Developed a precipitation logbook generator with site specific trends and where the current accumulations fall (IS very dry, dry, wet or very wet) to tie back to specific decision points and management actions. Next steps include rain gauge construction plans, guides and videos; refinements to Precipitation Logbook Generator; developing online data management tool; and integration with DroughtView.

Emile will look into hosting a website for the group and presentation/meeting minutes will be made available. Look to recruiting representatives from additional federal agencies that have ties to climate related issues in the west. Emile will also ensure representatives from each hub/sub-hub will get an invite to the next meeting.

Document for weather networks including types of measurements, maintenance and QA/QC standards, etc. Chris Daly will put together a list of survey questions to send out to network managers. Possible S&T collaborative projects with USBR. Kelly Redmond, WRCC has a document analyzing met networks in the west, will pass along to group. Groundwater is a huge issue, what can we do to address those issues or get the conversation started? Groundwater in relation to atmospheric demands and climate change. Drought monitor and observation interpretation on a smaller scale, spatial variability. What is the definition of a drought, rangeland, etc?, some are interpreted differently from state to state and events may be misinterpreted or missed. Need honest feedback system to severity of drought or lack thereof, void of personal gain or bias.