The PCWG contributed 4 presentations to the joint session with the land ice WG and paleoclimate WG. Clara Deser isolated the influence of ocean coupling (upper ocean warming) on the atmospheric response to Arctic sea ice loss. Julienne Stroeve evaluated the mean Arctic sea ice seasonal cycle, September/March trends, and ice thickness distribution patterns in the CMIP5 and CMIP3 simulations during the late 20th century. Ed Blanchard evaluated relationships between the summer atmospheric heat flux into the Arctic (AHF) and September sea ice extent (SEI). Jen Kay introduced a PCWG “working document” on the observational needs for climate models in polar regions, described the PCWG CSL proposal for Yellowstone, and evaluated the polar climate in CESM-CAM5 including results from Kay et al. 2012.

The PCWG parallel session had 11 presentations. Elizabeth Hunke presented an update on several sea ice model development projects, including work focused at Los Alamos and in collaboration with external groups. Dave Bailey evaluated the Arctic and Antarctic sea ice in late 20th century CESM-CAM5 simulations. Meibing Jin gave a presentation on the parameterization of sub-grid scale ocean mixing by brine rejection in CESM. Gijs de Boer discussed the use of the Surface Heat Budget of the Arctic Ocean (SHEBA) experiment as a testbed for evaluation of Arctic processes in CESM. Neil Barton evaluated Arctic clouds in CAM4 and CAM5 using clustering and CALIPSO simulator output and observations (Barton et al. submitted). Justin Wettstein explained that strictly internal variability in the coupled dynamics and thermodynamics of the ice-atmosphere-ocean system is a leading contributor to sea ice trends in a 39-member ensemble of the CCSM3. Wieslaw Maslowski evaluated Arctic climate simulations from CCSM4, CMIP5, and regional models (RACM, NPS NAME). After his presentation, concerns were raised on the representativeness of comparisons completed over such short time periods (e.g., 1997 vs. 2003). It was mentioned that determining time periods over which observations can be credibly used to evaluate models would be a useful contribution to the PCWG observational needs for climate models document. Ute Herzfeld discussed a recently funded NSF project to observe sea ice deformation and morphogenesis and to evaluate the implications of these observed sea ice properties for CICE parameterization of ridges and surface roughness. Clara Deal discussed BGC in sea ice including modeling the dimethylated sulfur compounds. Matt Higgins discussed Arctic phenological changes in off-line CLM experiments. Laura Landrum presented new work to evaluate the influence of a summer ice-free Arctic on the ocean in the absence of increased greenhouse gases.

After all of the contributed presentations, we had a discussion. Prior to the working group meeting, Jen Kay, Gijs de Boer, and Elizabeth Hunke drafted a working document describing the use of observations by the PCWG. The creation of this working document was motivated by the fact that observations are essential for motivating and establishing improvement in the representation of polar processes within climate models, and that we believe explicitly documenting the current methods used to develop and evaluate CESM with observations will help inform and improve collaborations between the observational and climate modeling communities. The discussion was quite spirited. Nearly everyone in the room contributed an idea or two, a sign of the importance of observations to the PCWG. Masha Tsukernik took notes, and after the meeting, Jen Kay incorporated the key ideas back into the working document. After the meeting, input from the polar community has been requested in particular on the observations wish list of polar climate modelers (If Santa came tomorrow, what polar observations would he bring? as Elizabeth put it) and the current use of observations to evaluate the polar climate in CESM. We anticipate this working document will be useful for the PCWG and polar communities in general and look forward to related input and discussion.
A number of other topic areas were discussed for possible future activities, including urban areas and energy use, water in IAMs, modeling forestry management, and assessing renewable energy potentials.

The 1st water session was motivated by an in depth presentation by Lorna Katz from Denver water. The subsequent discussion focused on topics surrounding Process, Scale and Uncertainty and which methodologies should be pursued. Representatives from the water utility industry stressed the need for “usable data”, which is data with attached uncertainty at a scale that can be integrated into their hydro and operational models. The CESM scientists perspective centered on advancing the CESM modeling capability and the evaluation of “usability” in a model development context.

The second water session, led by Chris Anderson of Iowa State, looked to define a hybrid project that respects both; generate usable data that advances science and helps us to better understand the hydrologic impacts of climate change. This would involve understanding of vegetation changes, understanding the inputs needed into the WUCA hydrology models, better metrics for model verification/validation, and an extensive effort in downscaled the segregation involving comparison with observations refining the inputs to hydrologic models and bias adjustments. The hope would be that this process would, in turn, improve the climate/hydrologic modeling of CESM. This session also saw engagement from representatives of the US Bureau of Reclamation and Army Corps of Engineers.

The plan moving forward in the water sector was laid out in three time frames:

1. Now term – next few weeks
   a. Simple description of proposed runs/resources
   b. High priority variables/frequencies for community runs
      (in response to Marika)
   c. Test project forcing hydromodel with climate data
   d. Get Liaison – Analysis, run model, Data mgt

2. Short term – next few months –
   a. Identify workgroup – Behar, Kaatz/WUCA, JArnold/Corps, Levi/USBR, Kiehl, Gutowski, Clark/NCAR, Univ
   b. Identify analysis that can be completed in the next 6 months using existing runs,
   c. help plan the upcoming community runs.
   d. Investigate how to bridge the climate to engineering scales
   e. How to inform WUCA hydromodel development (what and why)

3. Long Term - How to use SDWG analysis to inform CESM hydro improvements
   a. Methodologies to generate larger ensembles of use to water utilities
   b. Did we mention a Liaison??

The next step will be to get started on the now term items and identify the workgroup for the short term project.

Finally, a joint session between the SDWG and the Land Model, BGC, and Chem-Climate Working groups was held. Overview presentations on current plans and activities were given by each group, followed by a discussion of areas of overlap and feedback on SDWG plans for activities in the near term. The discussion identified a number of potential areas of common interest, including the regional climate implications of land use change and specific biogeophysical processes that govern this effect, the intersection of water/energy/food, the impacts of climate change on crops, climate-carbon cycle feedbacks and their implications for emissions modeling, the impacts of air quality on health and agriculture, and methods for reduced-form modeling of air quality and its impacts. It was generally agreed that the format of the working group meetings – holding several working group meetings back-to-back within a single week – was very useful and that interaction among the groups is likely to grow over time.