A number of projects conducted within HAP focus on assisting decision and policy-makers to better understand the impact of climate change impacts on the water cycle, high impact weather, winter weather, user needs for water resources and flood warning and control. The research and development efforts in HAP are designed to advance our understanding of the water cycle under current and future climate conditions and to meet the hydrometeorological needs of national, local, and international organizations in the public and private sectors.

HYDROMETEOROLOGY COMMUNITY MODELS

HAP scientists have developed and support a number of hydrometeorology related models that are available to the community. These models include land surface models (NOAH-MP, HRLDAS), hydrological models (WRF-Hydro, SUMMA), water resources management models (WEAP), downscaling models (ICAR), and...
models linking urban and crop characteristics and behaviors to the Weather Research and Forecast model (WRF-Urban and WRF-Crop).

**COMPUTATIONAL HYDROLOGY**

Scientists and engineers in HAP are collaborating to build new community hydrologic research and applications datasets, models and methods that will advance our nation’s capability to monitor, predict and project hydrology and to inform water management and planning.

**HDYROMET OBSERVATIONS**

Observations of hydrometeorological processes provide foundational understanding of how weather and hydrologic phenomena combine to create both societal risks and key societal resources. HAP has developed and deployed innovative observations in field programs around the world to create new knowledge.

**LAND–ATMOSPHERE INTERACTIONS**

The research in this area is designed to help understand, through theoretical and observational studies, the complex interactions (including biophysical, hydrological, and biogeochemical interactions) between the land-surface and the atmosphere at micro- and meso-scales. The ultimate goal is to integrate such knowledge into numerical mesoscale weather prediction and regional climate models in order to improve prediction of the impacts of land-surface processes on regional weather, climate, and hydrology.

**NCAR STEP PROGRAM**

The NCAR Short Term Explicit Prediction (STEP) program is tackling the challenging problem of improving the accuracy of high impact weather at short time scales (less than a day) via a collaborative effort across several NCAR labs. The main focus of STEP during the past few years has been to improve the prediction of heavy precipitation and flash flood by developing an integrated hydro-meteorological system that includes data assimilation of radar data that is able to produce quantitative streamflow forecasts with improved rainfall and streamflow estimates.

**STREAMFLOW PREDICTION**

Scientists and engineers in HAP are undertaking research to facilitate the transition of streamflow prediction advances into operational streamflow forecasting practice in the US.

**NCAR WATER SYSTEM PROGRAM**

NCAR Water System Program The NCAR Water System Program (WSP) is a cross-Laboratory program that aims to improve understanding of the current water cycle and its likely evolution in a future climate.

**WEATHER OBS AND IMPROVEMENTS**

HAP scientists have conducted a wide variety of observations at locations around the world. This naturally has entailed the development of a local observational field site to test and evaluate new and existing instruments. The test site was developed at the NCAR Marshall field site starting in 1991 to fulfill this need.

**WINTER WEATHER**

It is not surprising that many western states have sought to augment water using operational cloud seeding programs. These programs are based on glaciogenic cloud seeding with either silver iodide (AgI) or liquid propane. HAP scientists have been involved with conducting research and development related to weather modification in Wyoming and Idaho and more recently in the United Arab Emirates.