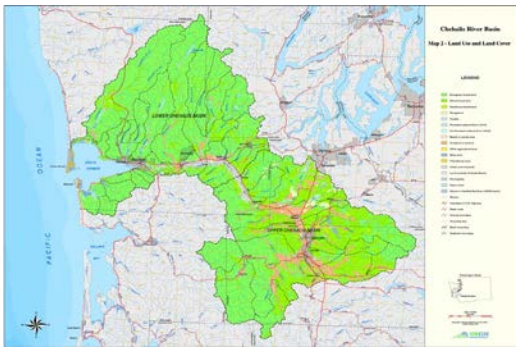
Summary of Chehalis Basin Rain Gauges Field Study

Introduction

Earlier this year, the National Aeronautics and Space Administration (NASA) launched a new satellite to measure precipitation (Global Precipitation Measurement mission or GPM; see http://www.nasa.gov/mission_pages/GPM/main/ for details). Previous NASA precipitation missions have primarily been relevant to the tropics. Building on these earlier missions, GPM will be able to detect falling snow, lighter rain and other microphysical properties of precipitation. A major advantage of GPM is that its orbit covers the contiguous United States. This will enable it to detect atmospheric river events, which play a major role in flooding along the West Coast.

Background and Need for Field Study

A series of ground validation experiments will be conducted to evaluate the accuracy of GPM satellite measurements through comparison with ground observations. Washington State is the location of one of these ground validation sites. OLYMPEX, a NASA/GPM Ground Validation Field Campaign in the Pacific Northwest, focuses on the high precipitation regimes on the west side of the Olympic Mountains as well as the Chehalis River Basin immediately to the south. OLYMPEX aims to physically validate the rain and snow algorithms of the GPM Microwave Imager and the Dual-Frequency Precipitation Radar using a combination of snowpack monitoring instrumentation and surface precipitation gauge networks. While most of the scientific experiments will focus on the Quillayute River Basin, the use of GPM for flood prediction will focus on the Chehalis River Basin. The Chehalis is a coastal watershed that is primarily rain-dominated, although some higher elevation areas receive snow.



The Chehalis River Basin part of OLYMPEX will be directed by Dr. Bart Nijssen (University of Washington) and Dr. Dennis Lettenmaier (UCLA Geography). The specific goal is to evaluate the utility of satellite-based precipitation estimates in flood prediction and to improve our understanding of the role of atmospheric rivers in high flow events. Different sources of weather information (satellite, surface observations including radar, and weather models) will be used as input to detailed hydrologic models of the Chehalis River Basin and the resulting flood predictions will be compared with observed streamflow. The study will include a field campaign in the Chehalis Basin to collect additional precipitation observations for at least one winter. The purpose of the field campaign is threefold: To improve the spatial characterization of precipitation in the basin; to correct radar-based precipitation estimates; and to evaluate satellite precipitation estimates.

Rain Gauge Network

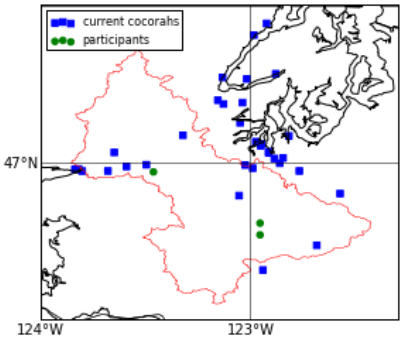
The field component of the project will involve the installation of rain gauges throughout the Chehalis Basin. We have three types of rain gauges that we plan to install:

1) CoCoRaHS “all-weather rain gauge”
2) dual tipping bucket gauge (runs on solar power, with back-up SD card for data storage)
3) bucket gauge (with antifreeze, pressure transducer and integrated datalogger)

The CoCoRaHS gauges require daily monitoring and are already used by the volunteer-based CoCoRaHS network in Washington (Community Collaborative Rain, Hail & Snow Network – http://www.cocorahs.org). We plan to recruit additional participants throughout the Chehalis Basin who are willing to record daily precipitation outside their homes. We will make the gauges available to them for free. There is already an active CoCoRaHS network of participants in the Chehalis and we are working with the WA CoCoRaHS coordinator to draw upon that network for our study. The other two gauge types have data loggers and do not require daily monitoring. Graduate students will play an important role in the field campaign and will check these gauges periodically to record measurements and performance. The dual tipping bucket gauge is a newer rain gauge currently in use by one of our NASA collaborators. This rain gauge sits on a platform and requires a physical enclosure. We plan to install these on public sites with fewer possible disturbances. The third type is an accumulating gauge that will be used at higher elevations in the Chehalis where snow is common. One major design challenge for the rain gauge network is that we would like to have gauges installed at a variety of elevations in the basin, but finding higher elevation locations is difficult, since few people live in those areas. Additionally, access to those areas is frequently cut off during the winter.

Timeline of Study

This year, 2014-2015, is the pilot year for the field study. We will install several of each of the three rain gauge types both to evaluate instrumentation and to compare performance in different settings (e.g. snow). We anticipate that field access will be a major barrier, since much of the Basin is privately owned. We would like to resolve these issues during the pilot. In the second year of the study, we plan to install between 50-100 rain gauges throughout the Chehalis Basin (most of these will be CoCoRaHS gauges).



Data Access and Management

All precipitation data that is collected during this study is available to the public. We welcome the opportunity to collaborate with other organizations and entities with similar objectives.

Contact Information

For more information, please contact Diana Gergel, a Ph.D. student in the University of Washington’s Department of Civil and Environmental Engineering who is coordinating the field study, at gergel@hydro.washington.edu.