1.3 PRELIMINARY RESULTS FROM IMPROVE: A FIELD STUDY TO VERIFY AND IMPROVE BULK MICROPHYSICAL PARAMETERIZATIONS IN MESOSCALE MODELS

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Despite steady and significant improvements in other aspects of numerical weather prediction, the improvement of quantitative precipitation forecasting (QPF) has advanced only slowly. One approach to potential improvement in QPF is a careful examination of the bulk parameterization of grid-resolved cloud microphysics and precipitation in mesoscale models. This is the motivation for IMPROVE (Improvement of Microphysical PaRameterization through Observational Verification Experiment), an ongoing field study in the Pacific Northwest. IMPROVE has two field components: a frontal precipitation study, which was conducted offshore of Washington State in January and February, 2001; and, an orographic precipitation study, which will be conducted in the Cascade Mountains of Oregon in November and December, 2001. Each of these two field campaigns is aimed at studying stratiform precipitation in environments that offer unique advantages in terms of quantity of precipitation and predictability of the controlling dynamics. See Fig. 1 for a map of the two study areas and the observational platforms deployed.

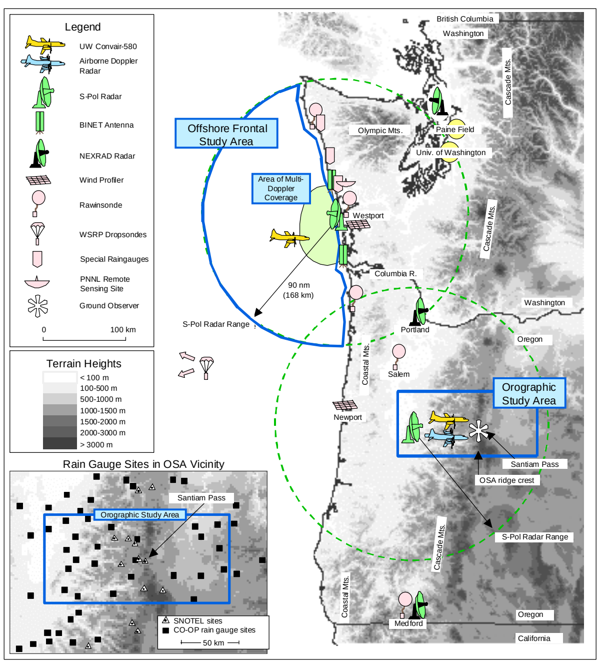

Figure 1. Observational platforms for IMPROVE.

Current bulk parameterizations of cloud and precipitation microphysics are based on relatively few observational studies; few dedicated efforts have been made to comprehensively evaluate the underlying assumptions and predicted hydrometeor distributions of the parameterizations in current use, and to use such evaluations to improve the parameterizations. The only way to perform such a verification in a manner that yields definitive and unambiguous results is to observe all aspects of the studied precipitation system, from 3-D temperature and wind distributions to microphysical parameters such as mixing ratios and particle size distributions. This requires concurrent use of in situ cloud and precipitation microphysical observations from a well-instrumented aircraft and remotely sensed (radar) observations of the 3-D wind field. This is the approach being taken in IMPROVE.

Preliminary results from the offshore frontal study will be presented, including microphysical, thermodynamic, and kinematic measurements. These will be compared to model-predicted fields, to evaluate current model performance in capturing the observed microphysical structure and evolution of selected rainbands, and to suggest areas of deficiency and potential improvement.

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