Predicting Landscape Hydrology Through the Scaling of Watershed Data

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- Microsoft Research
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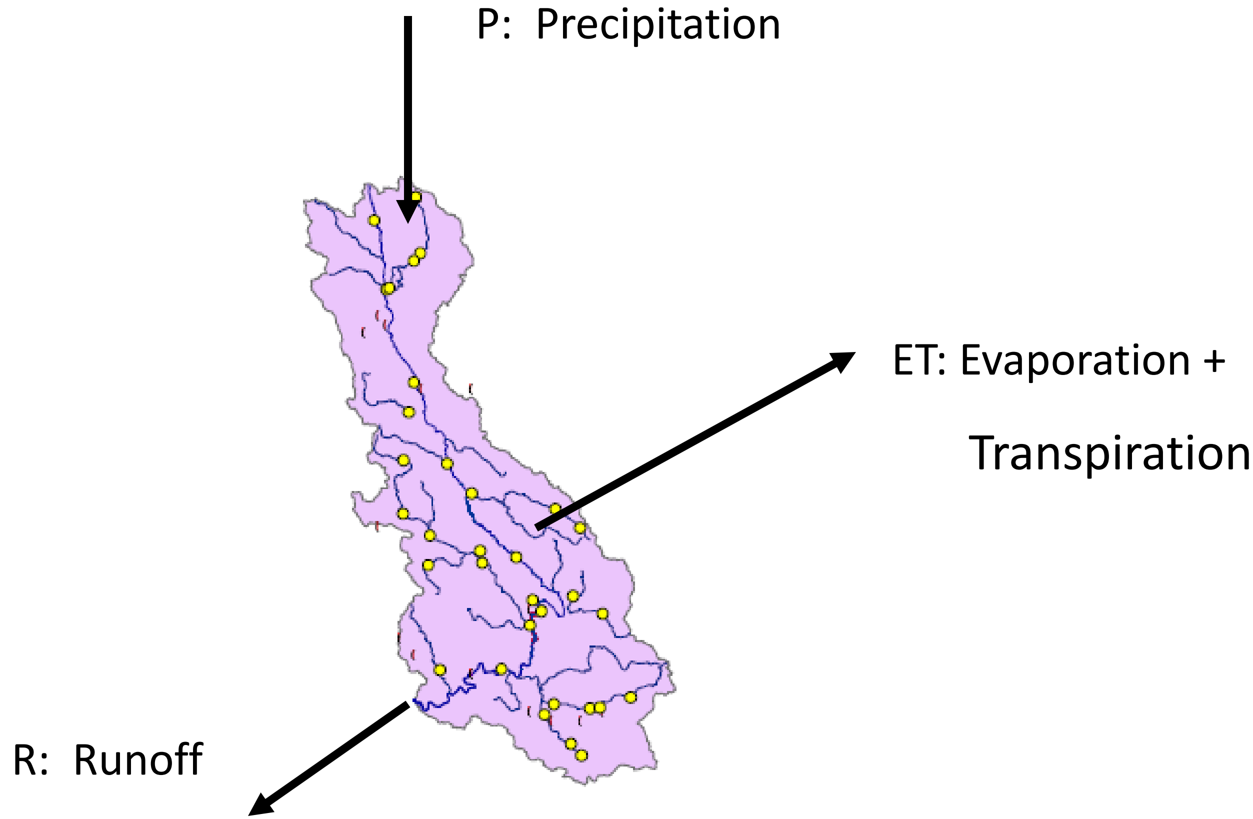
Landscape Complexity at Multiple Scales: Dry Creek, Russian River Watershed, Northern California

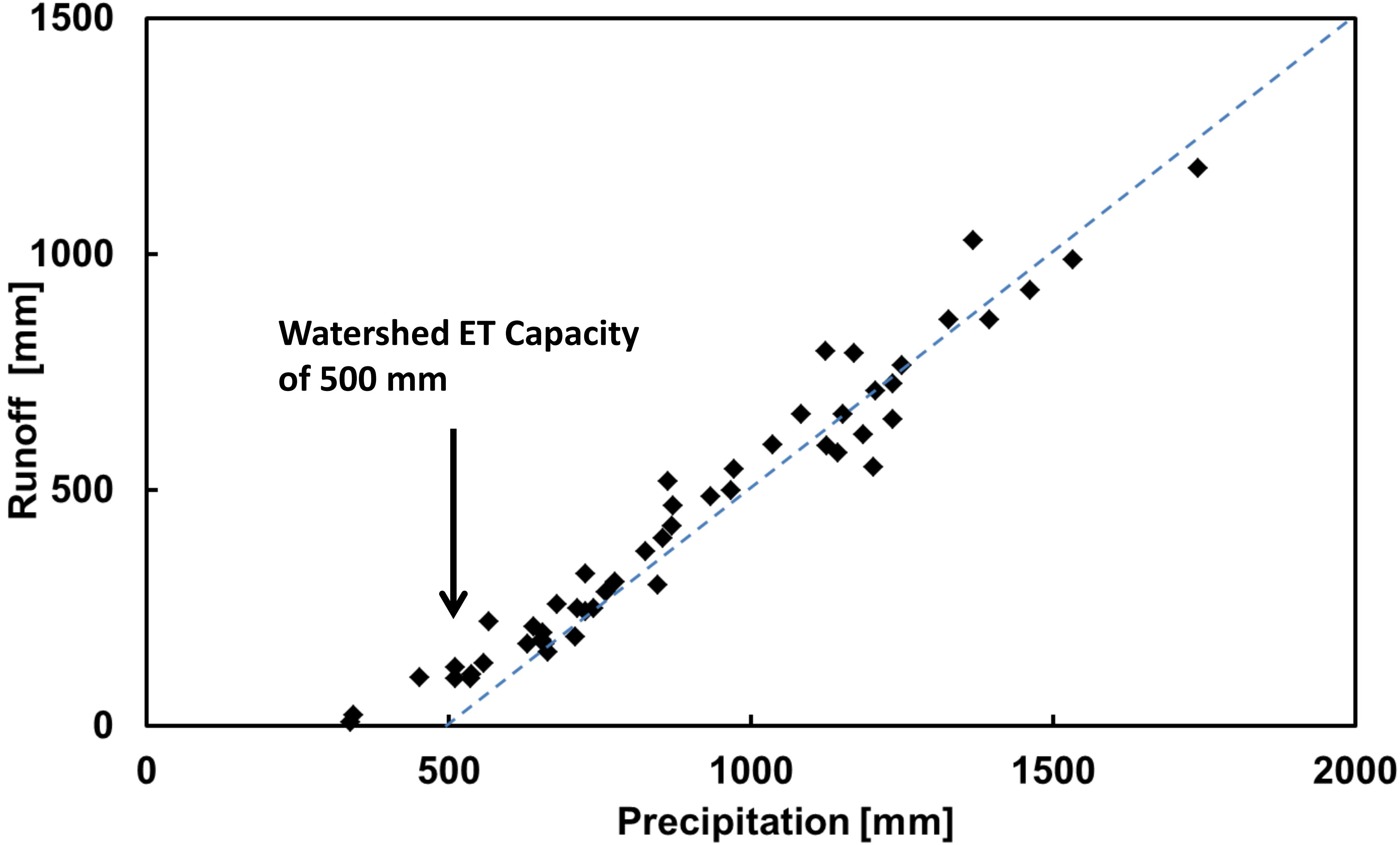
Data Analysis: Annual Water Balance Model



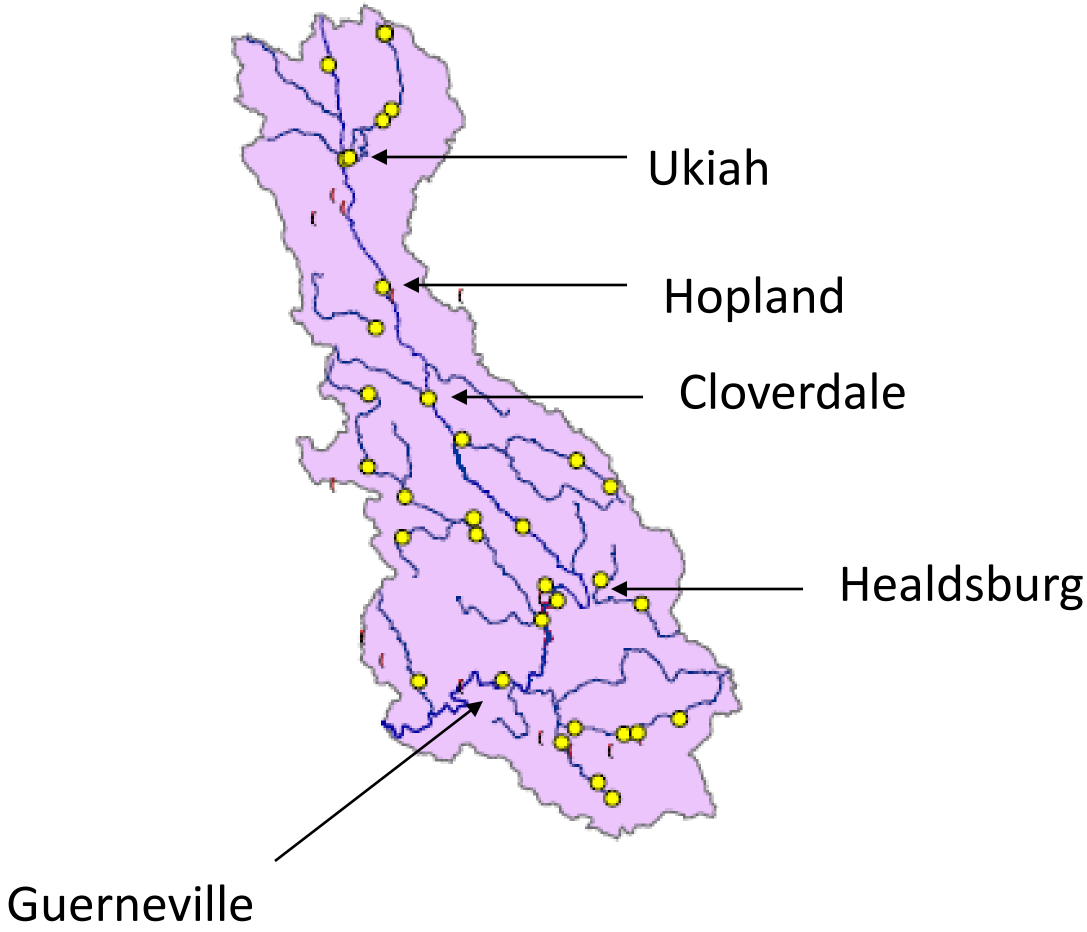
Water Balance: $P = R + ET + \Delta S$

Annual Water Balance: for $\Delta S \approx 0$ $R = P - ET$

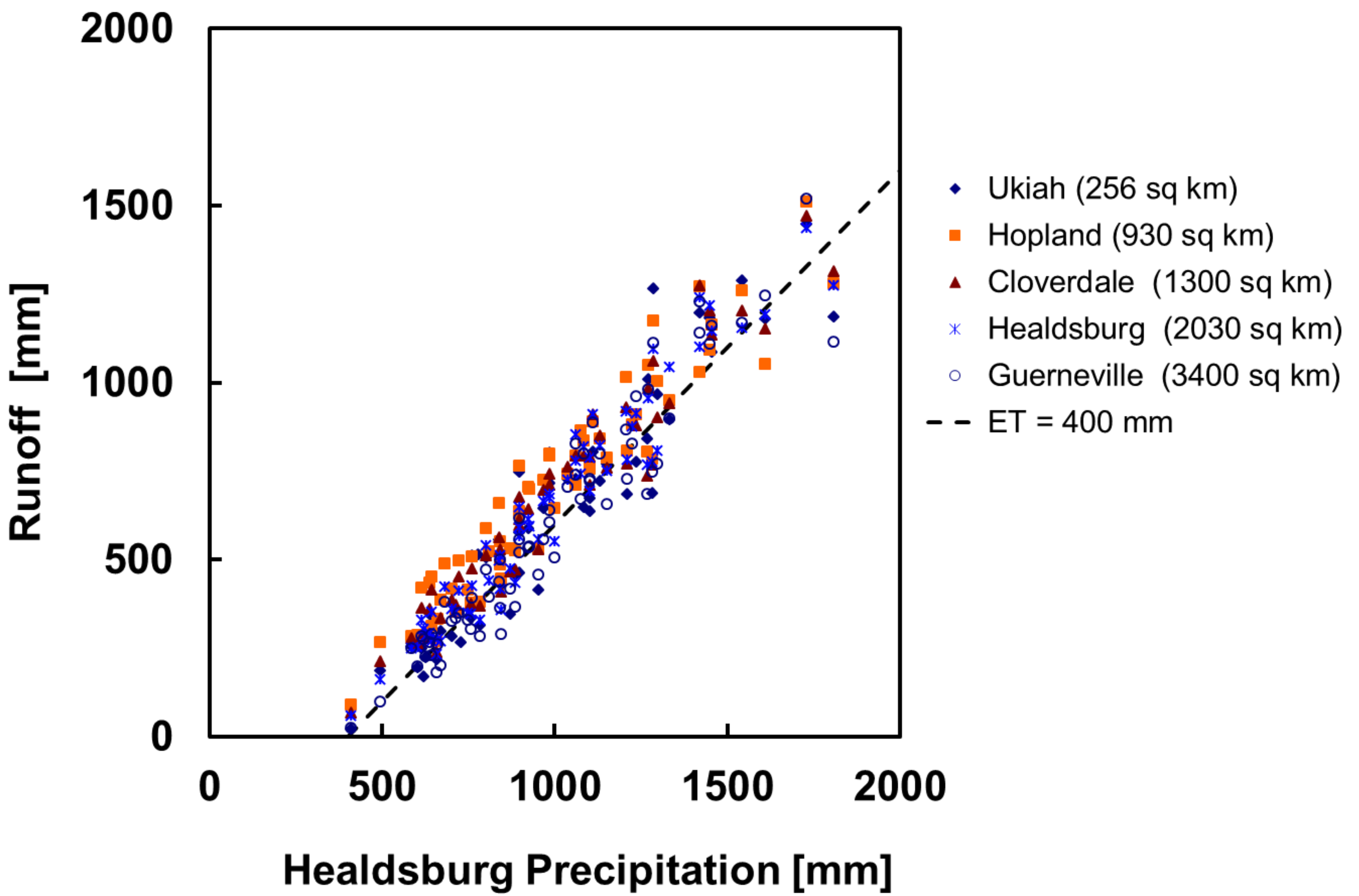
Observed Annual Runoff of Napa River near Napa, CA using St. Helena Precipitation over the period 1940 - 2006



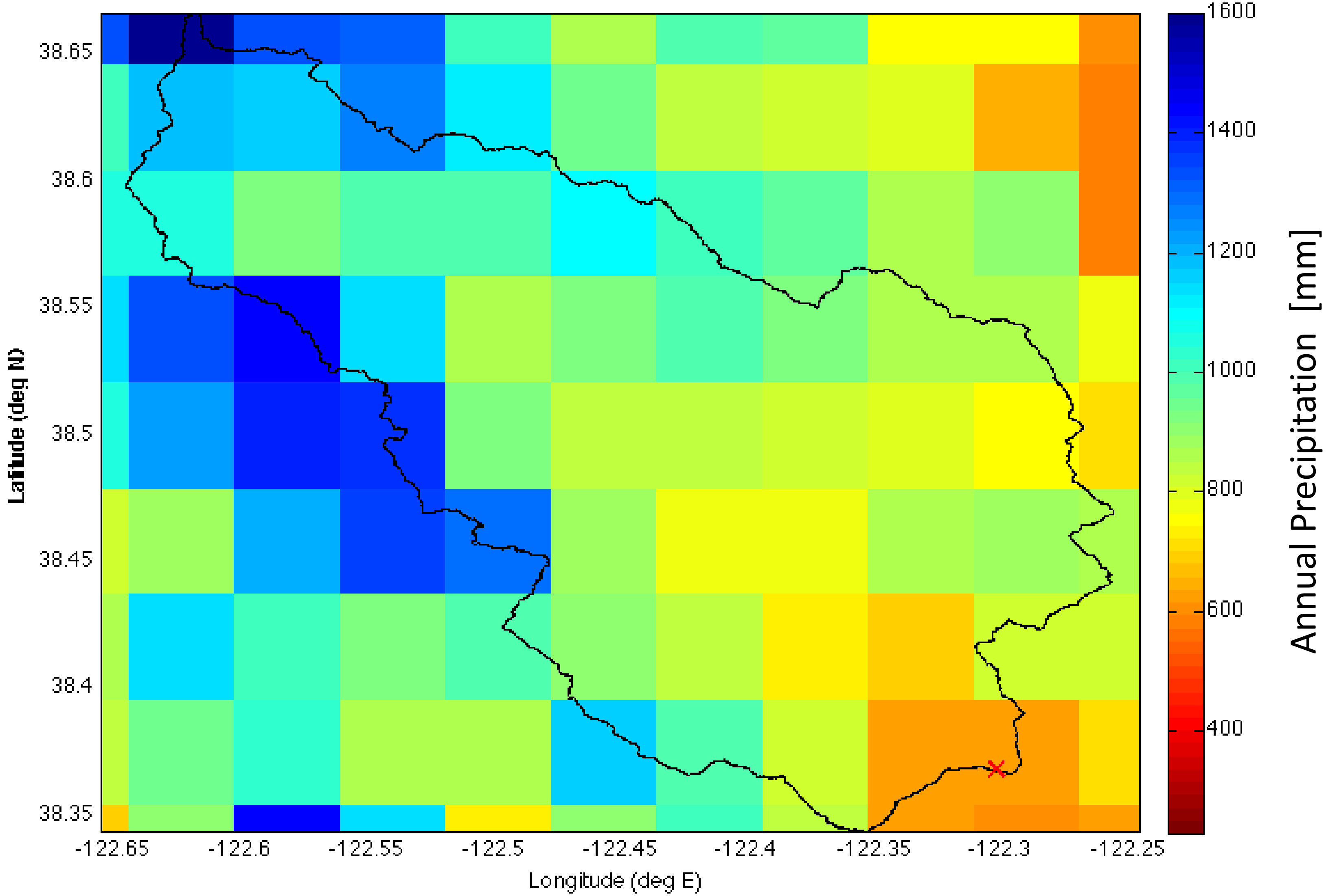
Russian River Watershed is Rich in Flow Monitoring Data, but not Data Accessibility



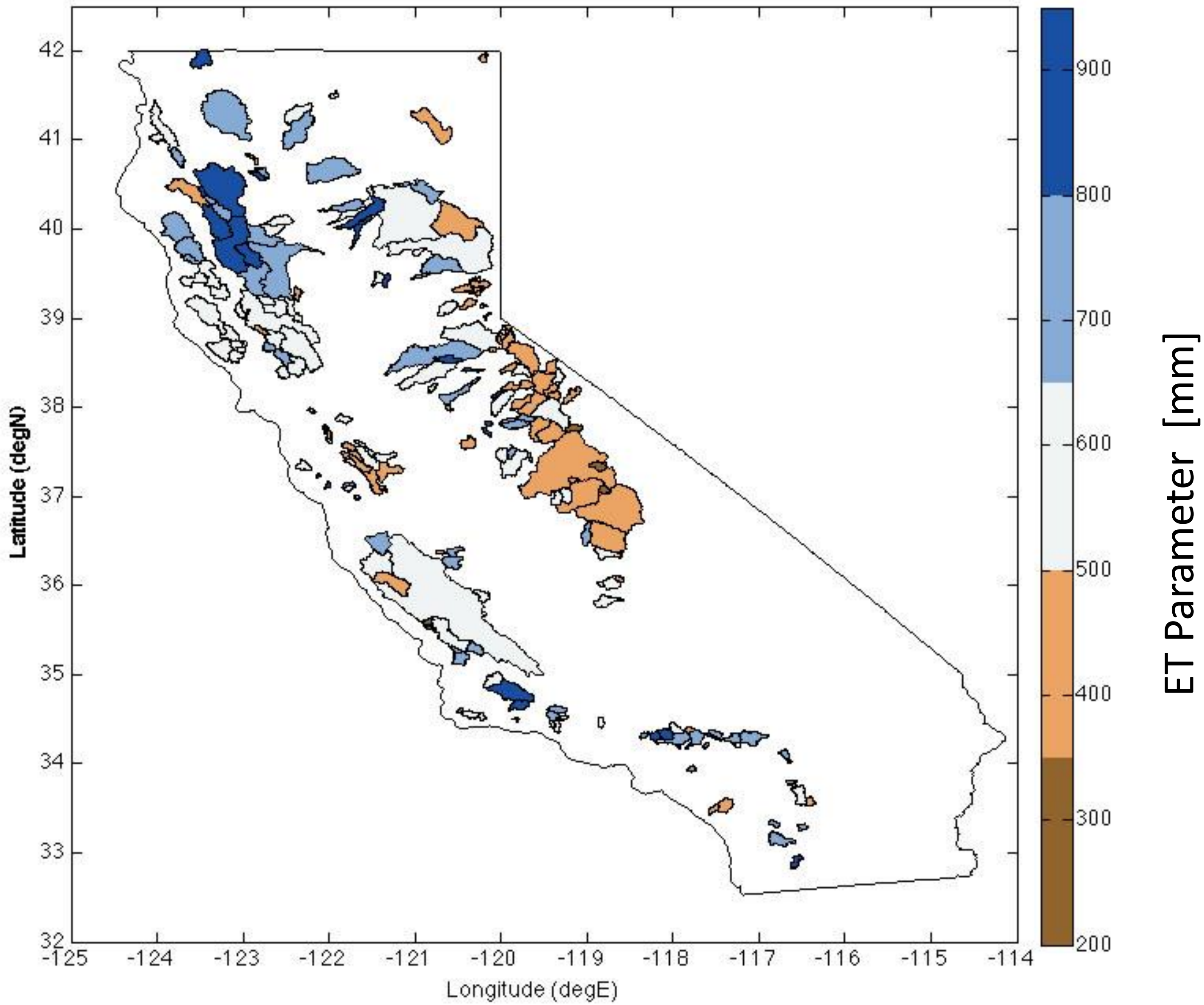
Annual Water Balance for Russian River Gauges



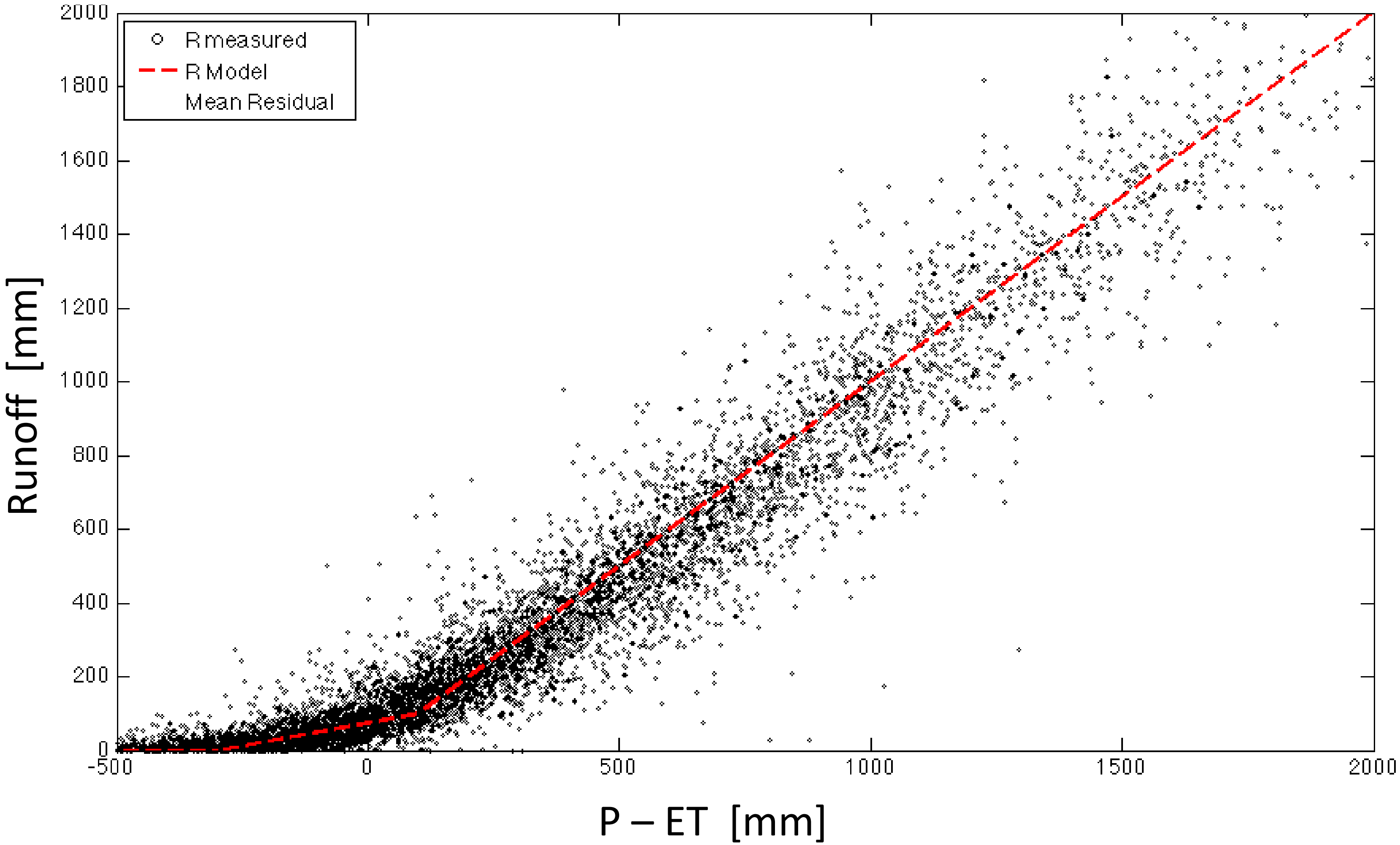
Spatial Variability of Precipitation using Oregon State University PRISM: Average Annual Precipitation over Napa River Watershed at 4 by 4 km Grid



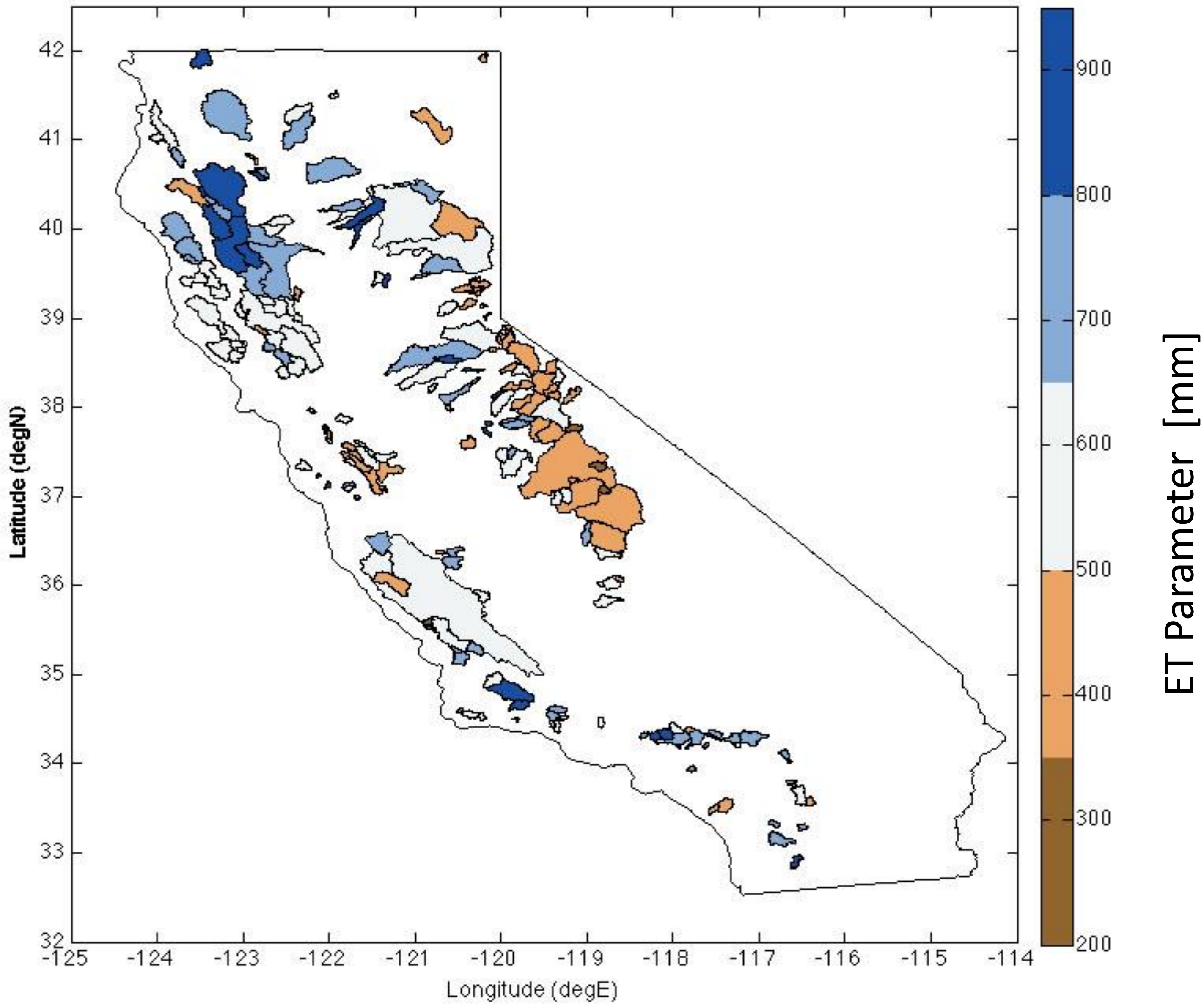
Fitted ET Parameter from Automated Analysis of over 220 Unimpaired CA Watersheds



Test of R = P – ET model for over 220 Unimparied CA Watersheds

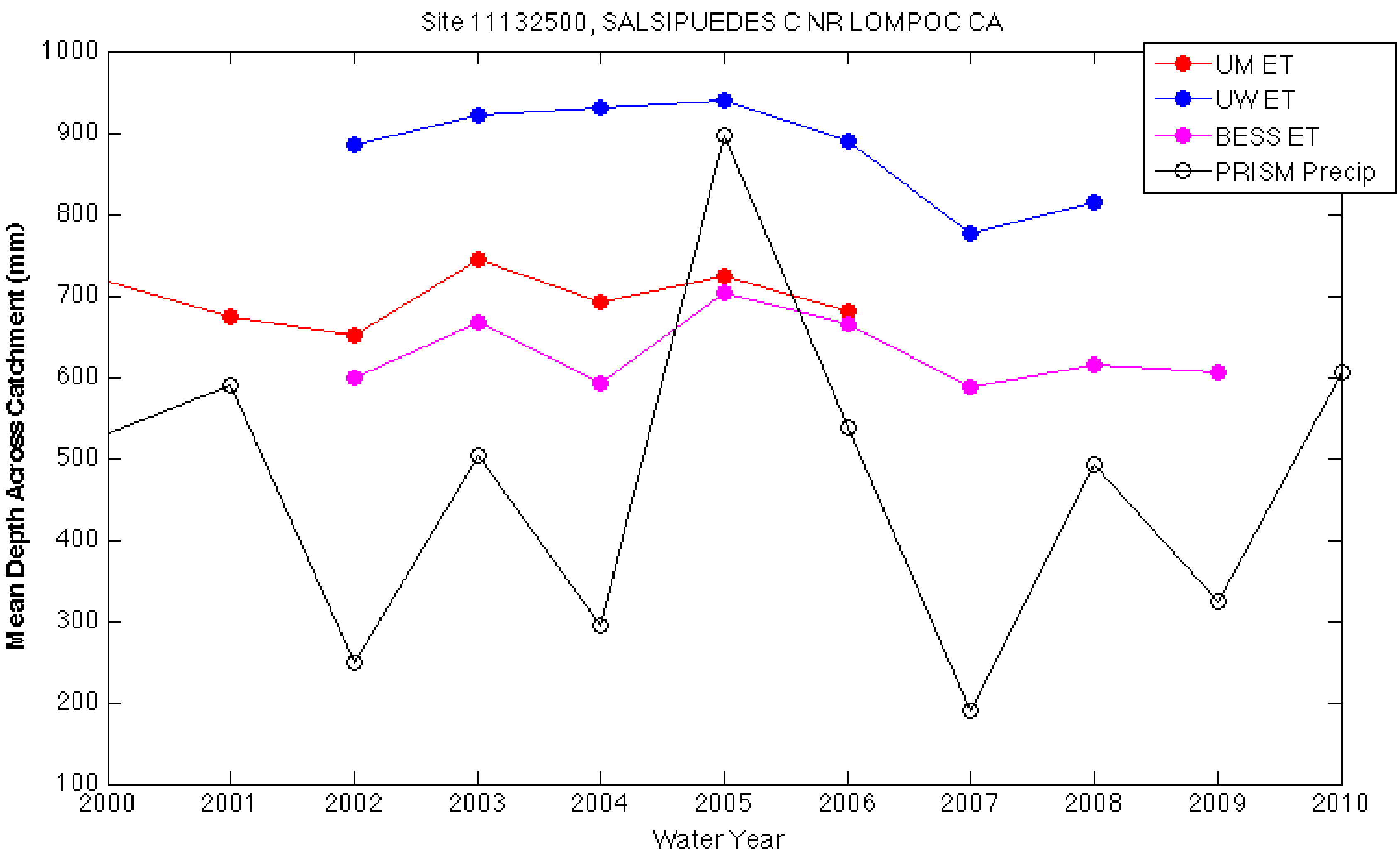


Fitted ET Parameter has Unexpected Spatial Variability.
There is a Possible Bias in Precipitation Estimates.



Progress Thus Far

- Access to environmental data on the web made analysis of 1 watershed tedious, but suggestive.
- Datacube access to integrated environmental data demonstrated spatial scaling.
- Cloud computing was required to test generalization at hundreds of watersheds.
- Demonstrated that watershed hydrology need not be restricted to n = 1.



Site 11132500, SALSIPUEDES C NR LOMPOC CA
UM ET
UW ET
BESS ET
PRISM Precip
Mean Depth Across Catchment (mm)
Water Year
1000
900
800
700
600
500
400
300
200
100
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010