Outline

• Quick HJ Andrews orientation
• Ideas on climate change and catchment comparison
• Some outstanding questions (that perhaps warrant Northwatch intercomparison)
The HJ Andrews gauged watersheds
A geomorphologically dynamic environment

WS3, 1996, junction with mainstem Lookout, after debris flows. Julia Jones
Coarse volcanic soils

Data from WS10, HJA, Rankin MS thesis as presented in Harr 1977 and re-plotted by Kevin McGuire
HJ Andrews in the Northwatch context

- A steep, wet, warm and permeable end member
- High altitude, high seasonality, ROS dominated
- Large landuse change legacy, rel. simple ecology
- Geomorphologically unstable, volcanic terrain

HJ Andrews Hydrology

- Long term landuse change effects
  - Jones and Grant 1996 WRR
  - Jones 2001 WRR
  - Seibert and McD 2009 HSJ
- Rain-on-snow
  - Harr, 1981 JoH
  - Mazurkiewicz et al., 2008 JoH
- Diel influences
  - Bond et al. 2002 HP
  - Wondzell et al., 2007 GRL
- Event runoff response
  - Harr, 1977 JoH
  - McGuire et al., 2006 AWR
  - Graham et al., 2010

Data: WS02, HJA
Air temperatures and precipitation at the HJ Andrews have changed little in 50 years

Warm sea surface temperatures bring warmer winters, less snow, and wetter summers (strong PDO link)

Isotope studies at HJ Andrews

Ecology

Hydrology

Soil Depth (cm)
Mean Residence Time and Topography

Climate change in the Pacific Northwest

Virtually gone. Computer models suggest that even moderate warming will drastically reduce the spring (peak) snowpack in the Oregon and Washington Cascades.
Local effects

Vache et al. in prep

Storage (mm) (Current)

Storage (mm) (+2.8 C)

Storage Difference (mm)

Vache et al. in prep
Q. How does water mix in the subsurface?

A. Fall Wetup
- Precipitation (Rainout)
- Tightly Bound Water
- Mobile Water
- Groundwater
- Streamflow

B. Rainy Season
- Precipitation (Rainout)
- Tightly Bound Water
- Mobile Water
- Groundwater
- Streamflow

C. Dry Season
- Transpiration
- Evaporation
- Mobile Water
- Groundwater
- Streamflow

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Q. How does rainfall mix with snowmelt during ROS?

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Brooks et al., in review

Berman et al., 2009 WRR
How can we include gw dynamics in our watershed models?

Summary

• HJ Andrews within Northwatch
  – High altitude, high seasonality, ROS dominated
  – Steep, wet, warm and permeable
  – Large landuse change legacy, rel. simple ecology
  – Geomorphologically unstable, volcanic terrain

• Ideas on climate change and catchment comparison
  – HJ Andrews as a benign climate change end member
  – A place to see snow disappearance within Northwatch

• Questions that may warrant intercomparison
  – Role of deep groundwater?
  – Mixing in the subsurface?
  – ROS runoff dynamics?