1. Introduction

This study examines the climatic drivers of spatial and temporal variability in carbon exchange across the Cascade Mountains.

- First, we identify the regional climatic drivers.
- Next, we link stand to landscape variability in carbon exchange to climate using a flux tower chronosequence, forest inventory, and tower pixel MODIS data.
- Finally, we use MODIS and the Advanced Canopy-Scale Atmospheric-Soil Algorithm (ACASA) model so that we can identify how multiple drivers can be linked to regional vegetation anomalies.

2. Methods

This project compares CO2 exchange from multiple sources and scales:

- Flux tower chronosequence
- MODIS
- Forest inventory
- Tower pixel MODIS (ACASA)

3. Climatic Drivers: Pacific Teleconnections

4. Stand Level Results: Flux Tower, Forest Inventory and MODIS tower pixel

5. Regional Scale Results: MODIS and WRF-ACASA

6. Conclusions

- The Composite Climate Indices accurately represented regional climate variability and explained much of the interannual variability in carbon exchange as seen in the flux tower, forest inventory measurements, and tower-pixel EVI.
- The flux tower chronosequence showed that age-effects significantly change the timing and magnitude of peak carbon uptake. Forest age must be taken into account in landscape and regional carbon studies across the heavily-logged Cascade Mtns., where clear-cuts are often less than 1 km² in area.
- On a regional-scale, MODIS EVI anomalies were not linked to teleconnection events for forested areas, likely due to age-effects, variability in non-forested areas was linked to the climate indices. The MODIS1A (1 km) is too coarse to capture age-related forest variability in this region.
- Next steps are to use MODIS1Q (250 m) and run WRF-ACASA at 1-km with MODIS LAI and high resolution land use data to tease out small-scale variability in the highly fragmented forests.