Transport and Deposition of Contaminants to Glacier National Park

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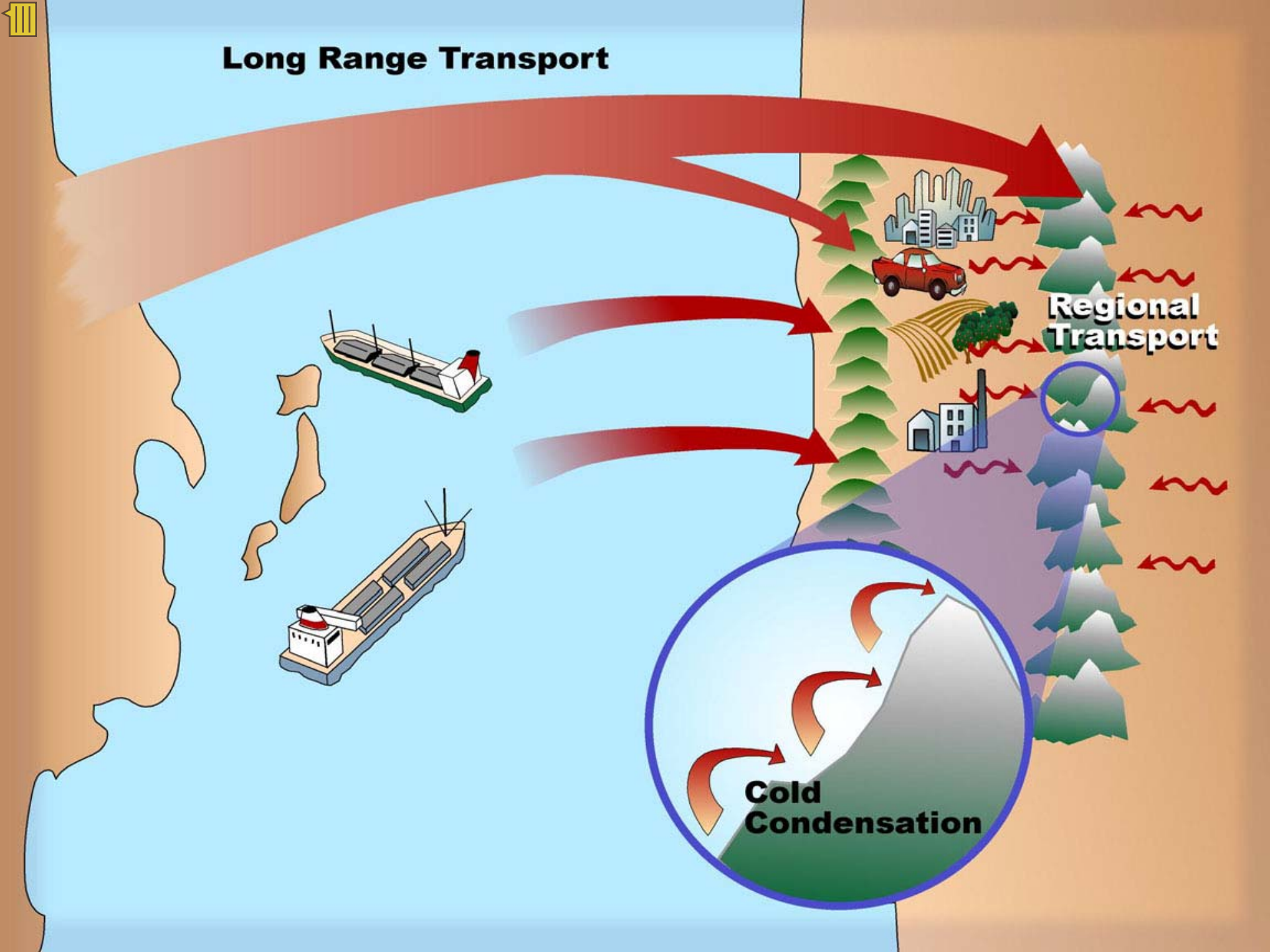
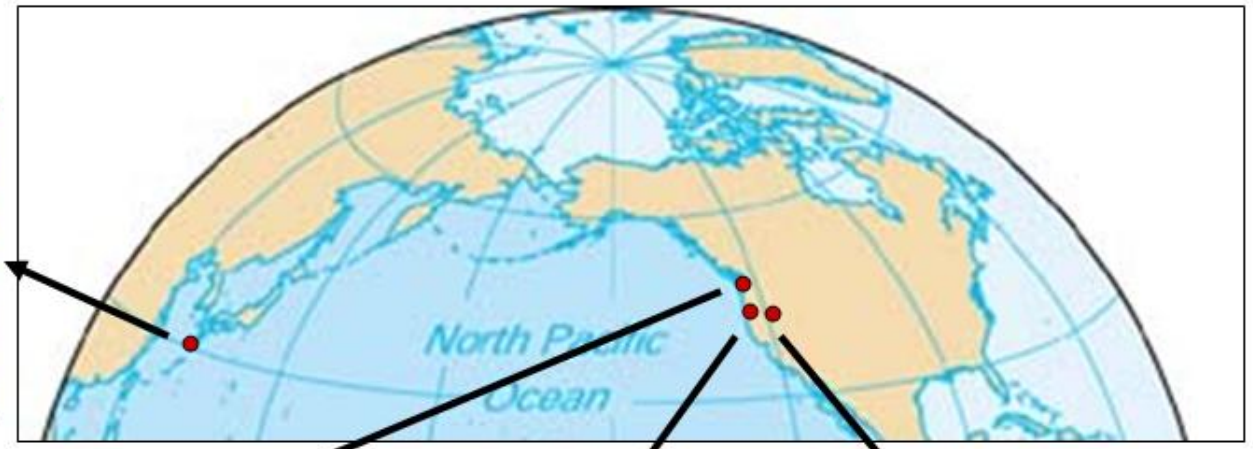
GLAC Workshop – Missoula, MT – 23 April 2008


Long Range Transport
Regional Transport
Cold Condensation

AIR SAMPLING

Okinawa, Japan
60 m

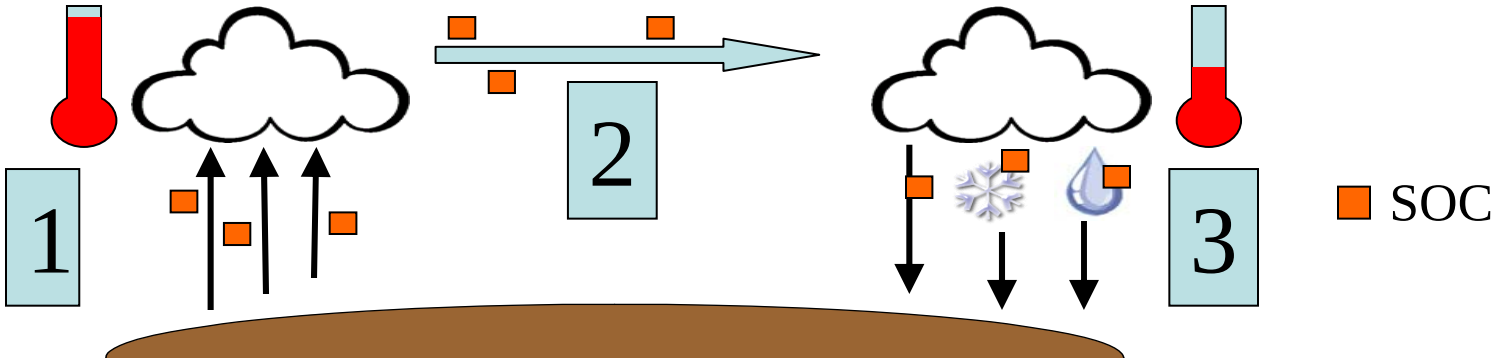


Cheeka Peak Observatory
Tip of Olympic Peninsula
500 m

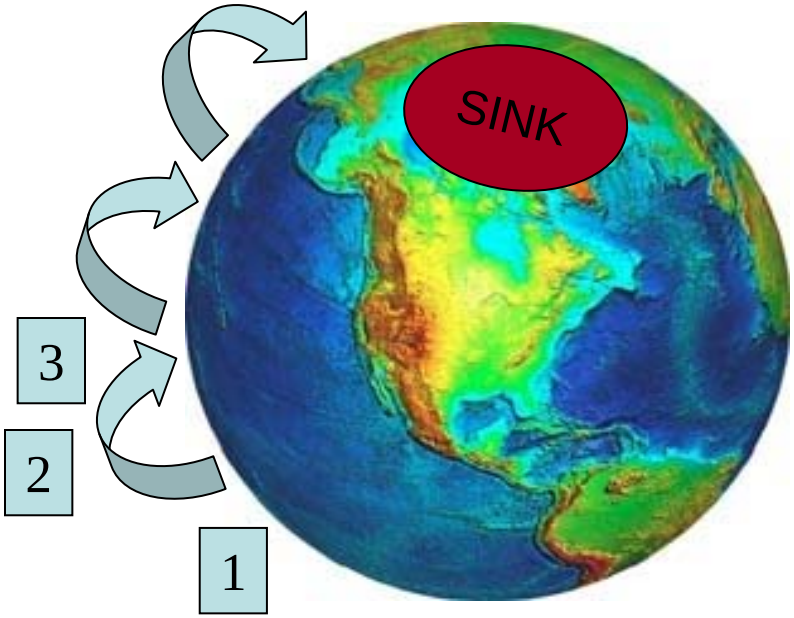
Marys Peak
Oregon Coast Range
1250 m

Mt. Bachelor
Oregon Cascade Range
2800 m

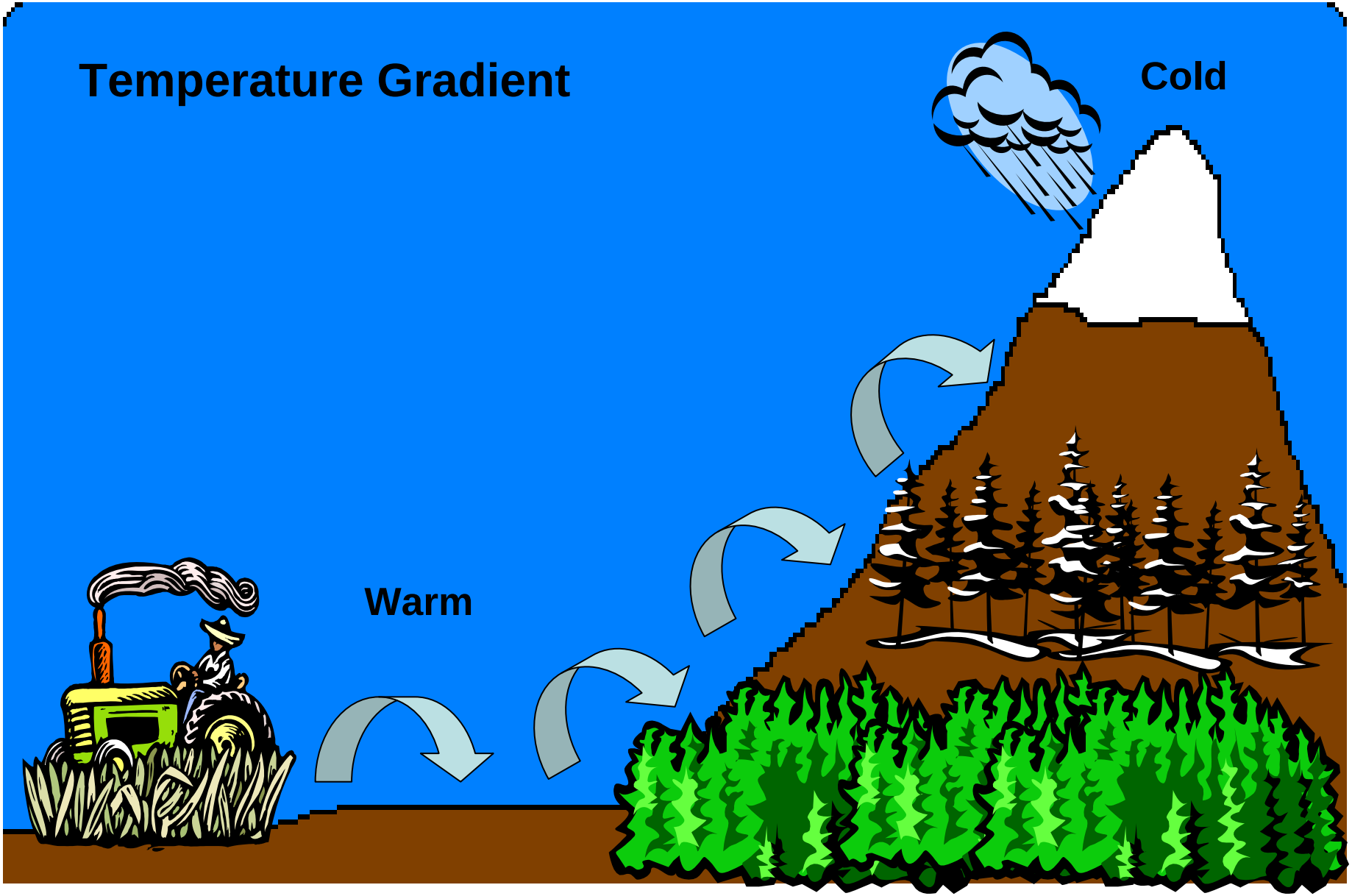
GLOBAL DISTILLATION or COLD CONDENSATION



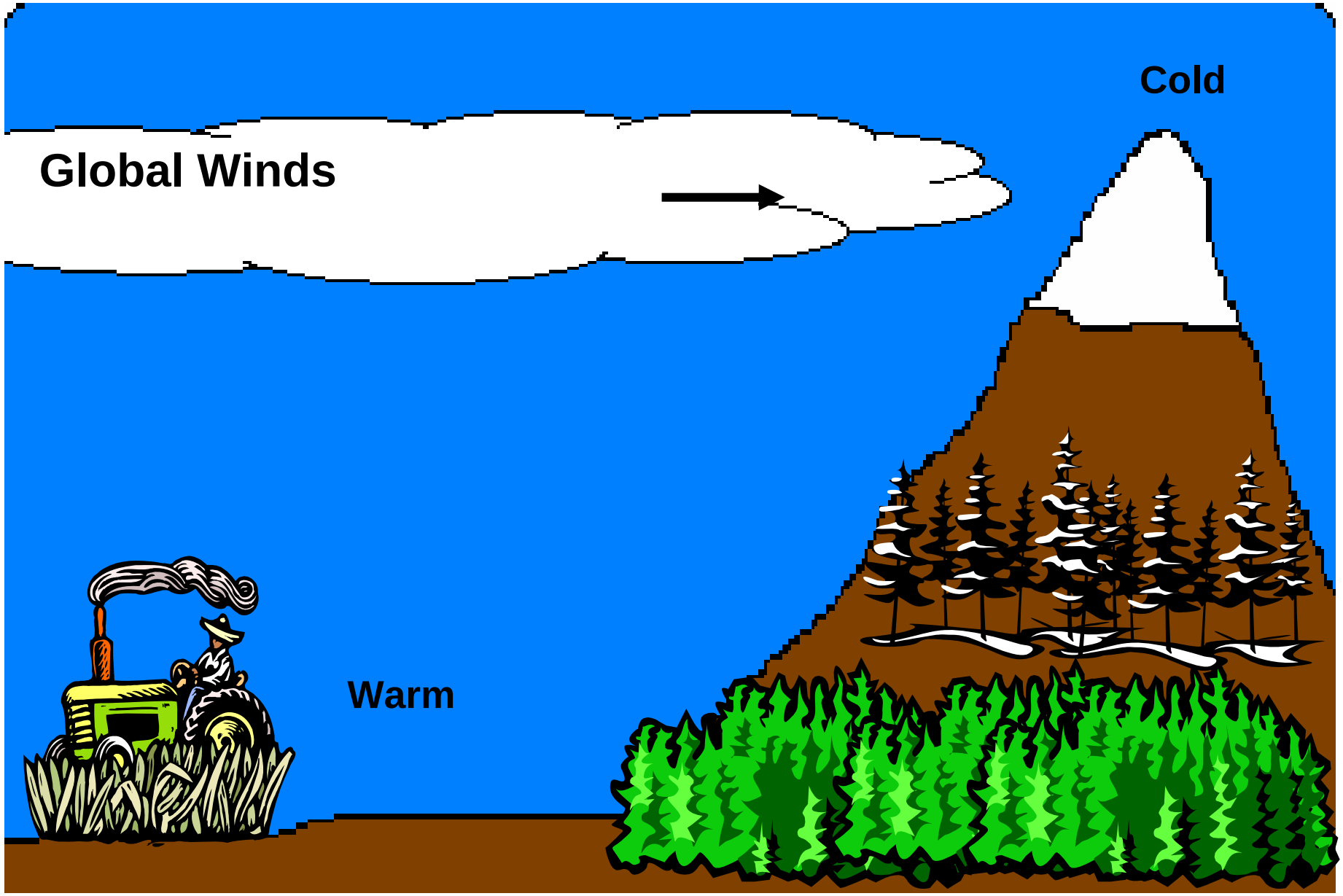
1. At warm temps, semi-volatile organic compounds (SOCs) volatilize into the atmosphere.
2. SOCs are transported in the atmosphere.
3. At cold temps, SOCs condense and undergo deposition.



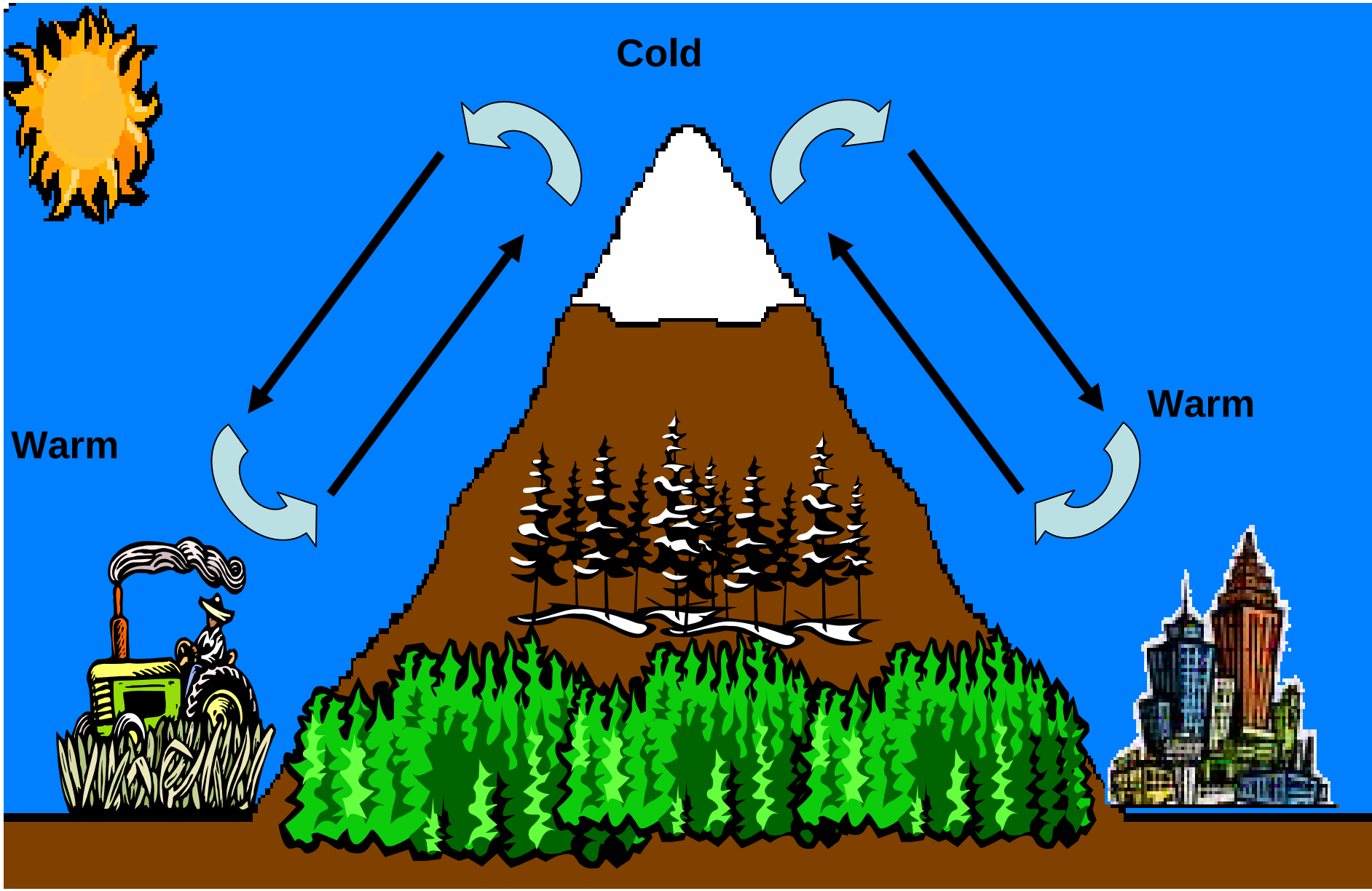
OROGRAPHIC COLD TRAPING



LONG-RANGE TRANSPORT AND DEPOSITION

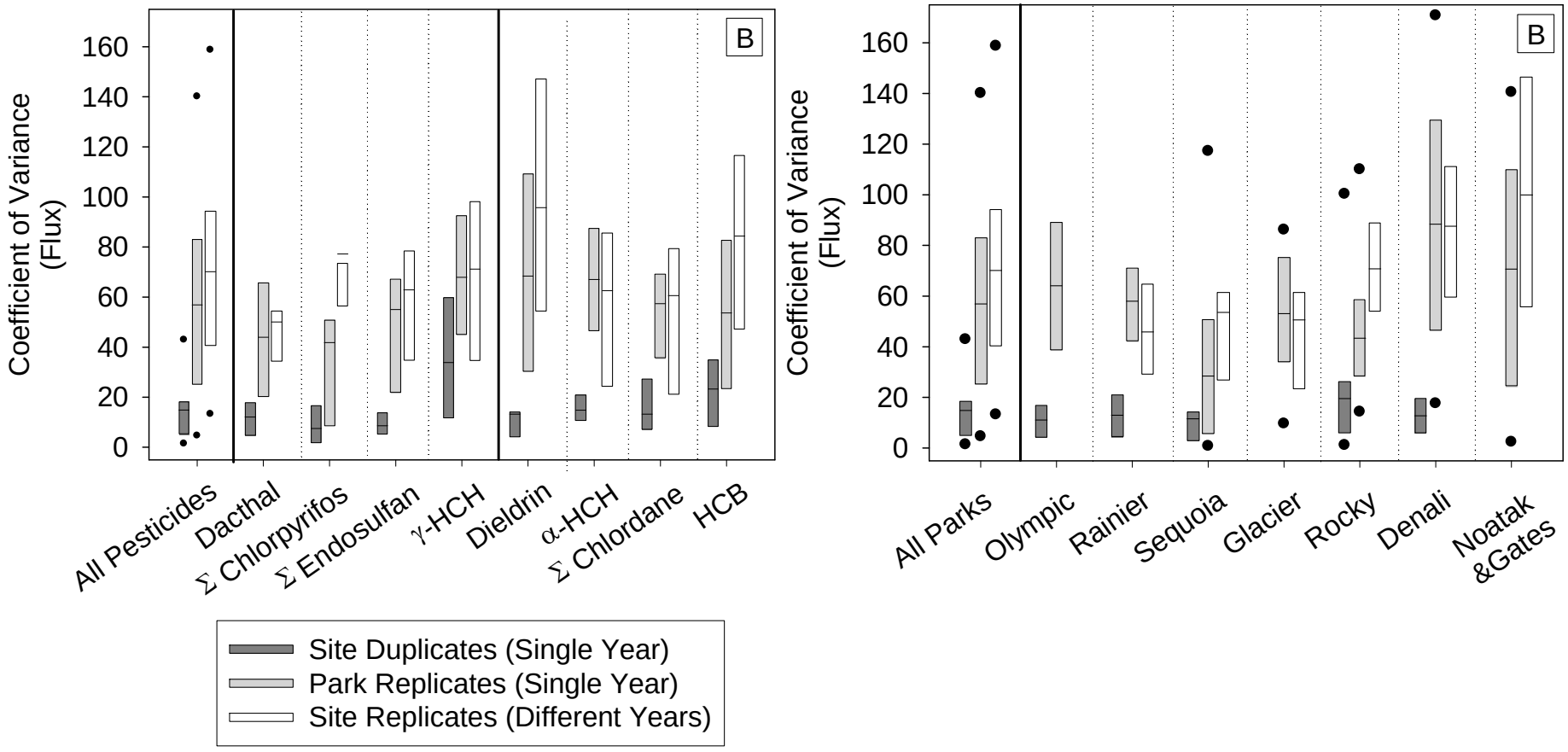


REGIONAL/LOCAL TRANSPORT AND DEPOSITION

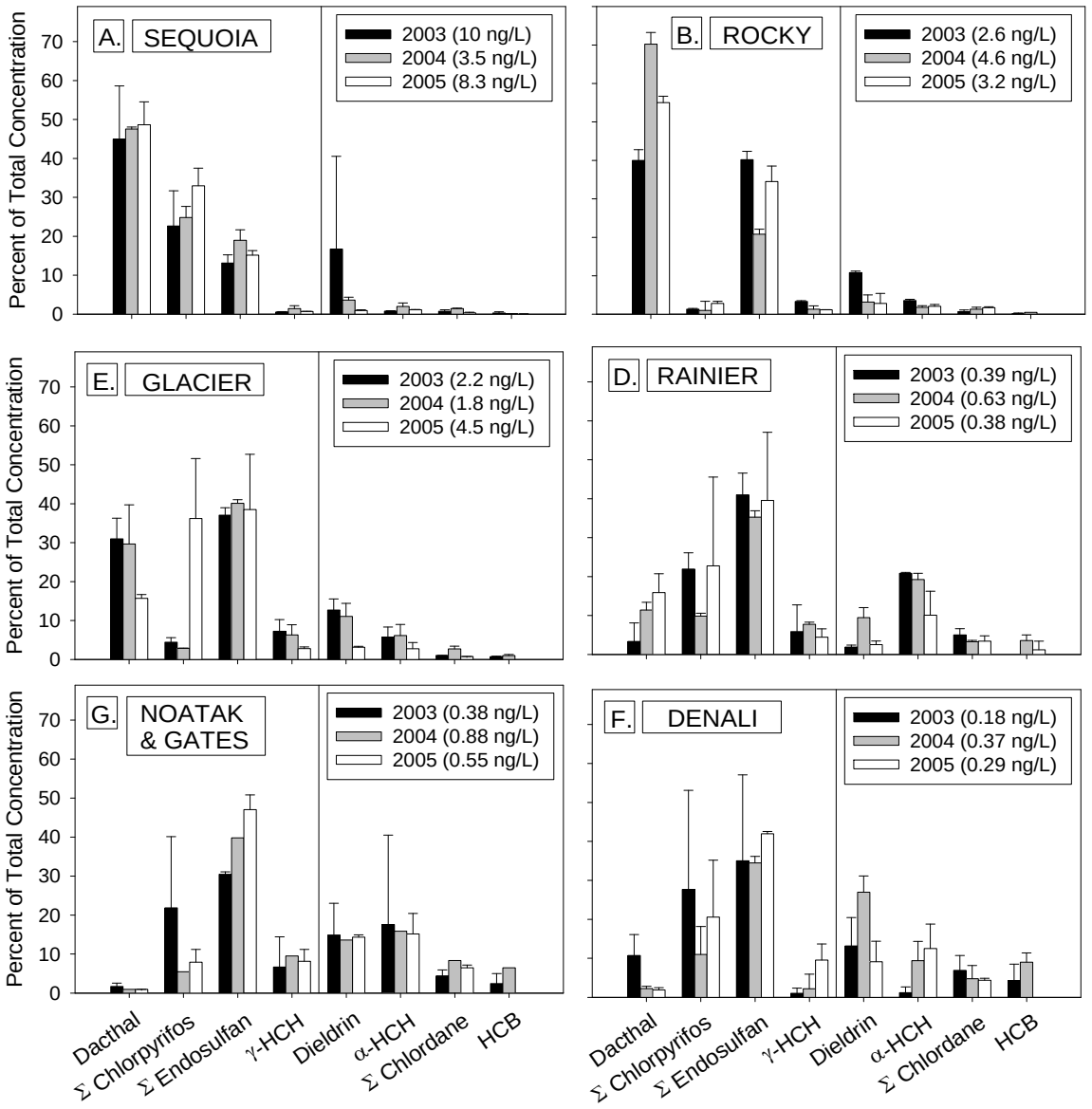


VARIATION IN PESTICIDE FLUX IN SNOWPACK

2003, 2004, and 2005

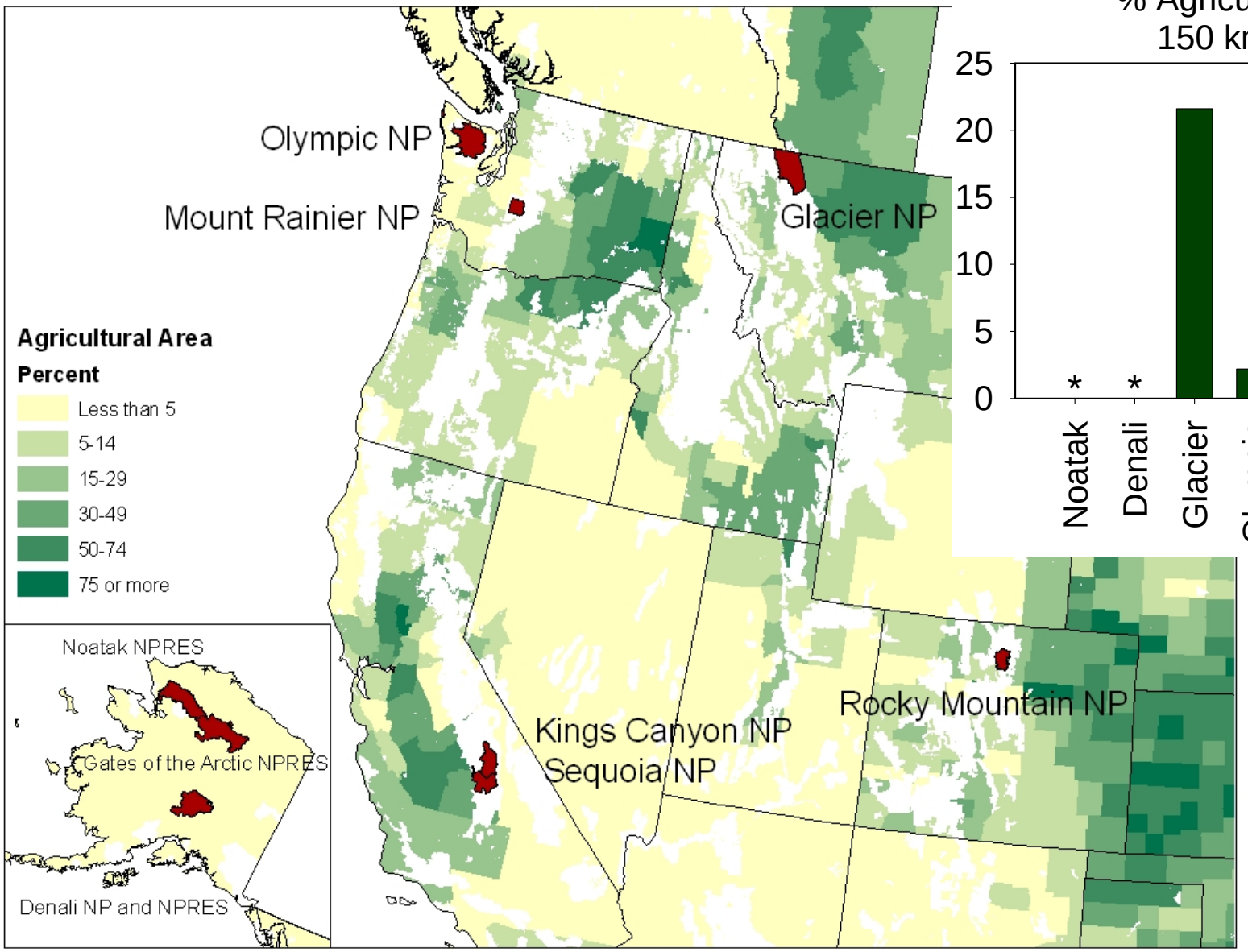


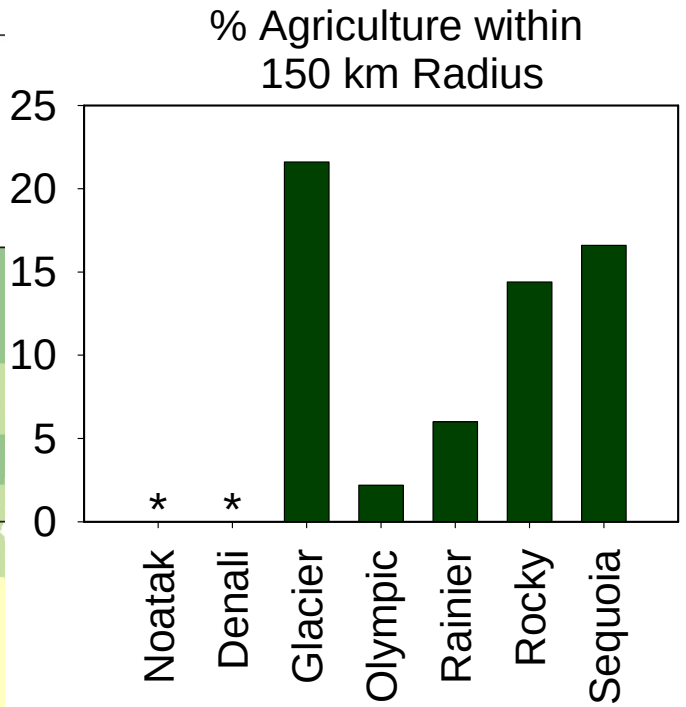
ANNUAL PESTICIDE PROFILE IN SNOWPACK



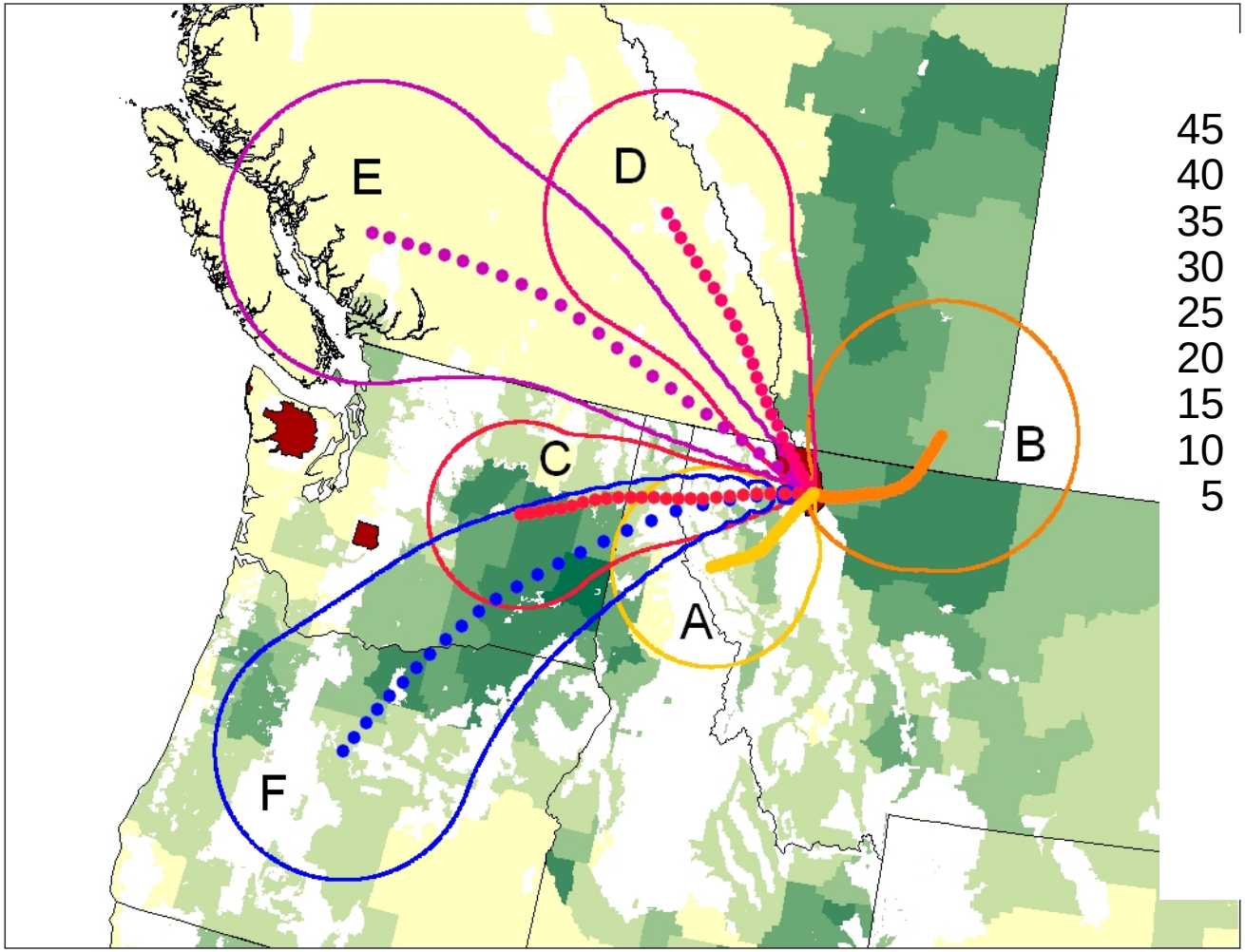
- Pesticide profile is unique to each Park (different sources)
- Park pesticide profile is consistent year to year (same source each year)
- HUPs due to revolatilization from historically contaminated soils
- CUPs from current regional pesticide use
- GLAC: g-HCH use in Canadian prairies

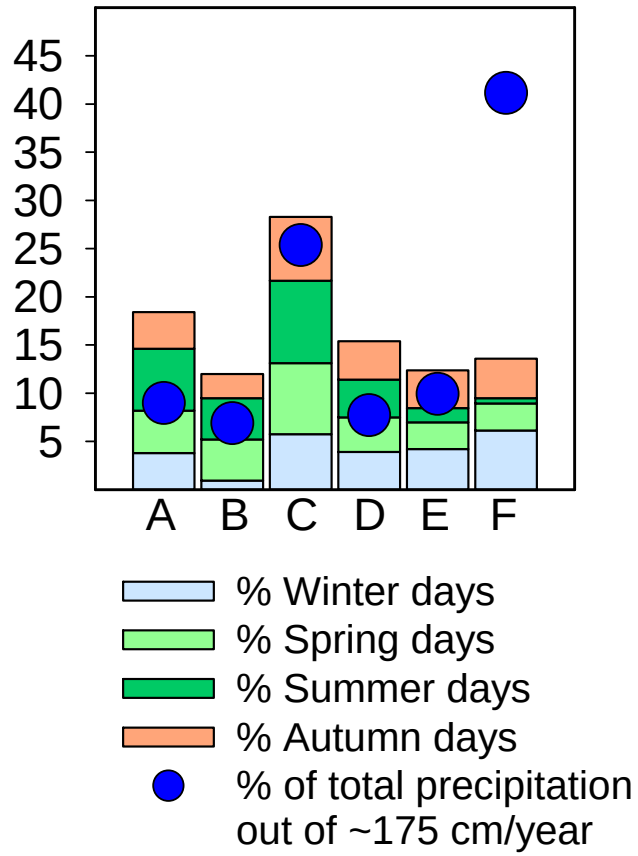
Agricultural Lands in the Western US and Canada





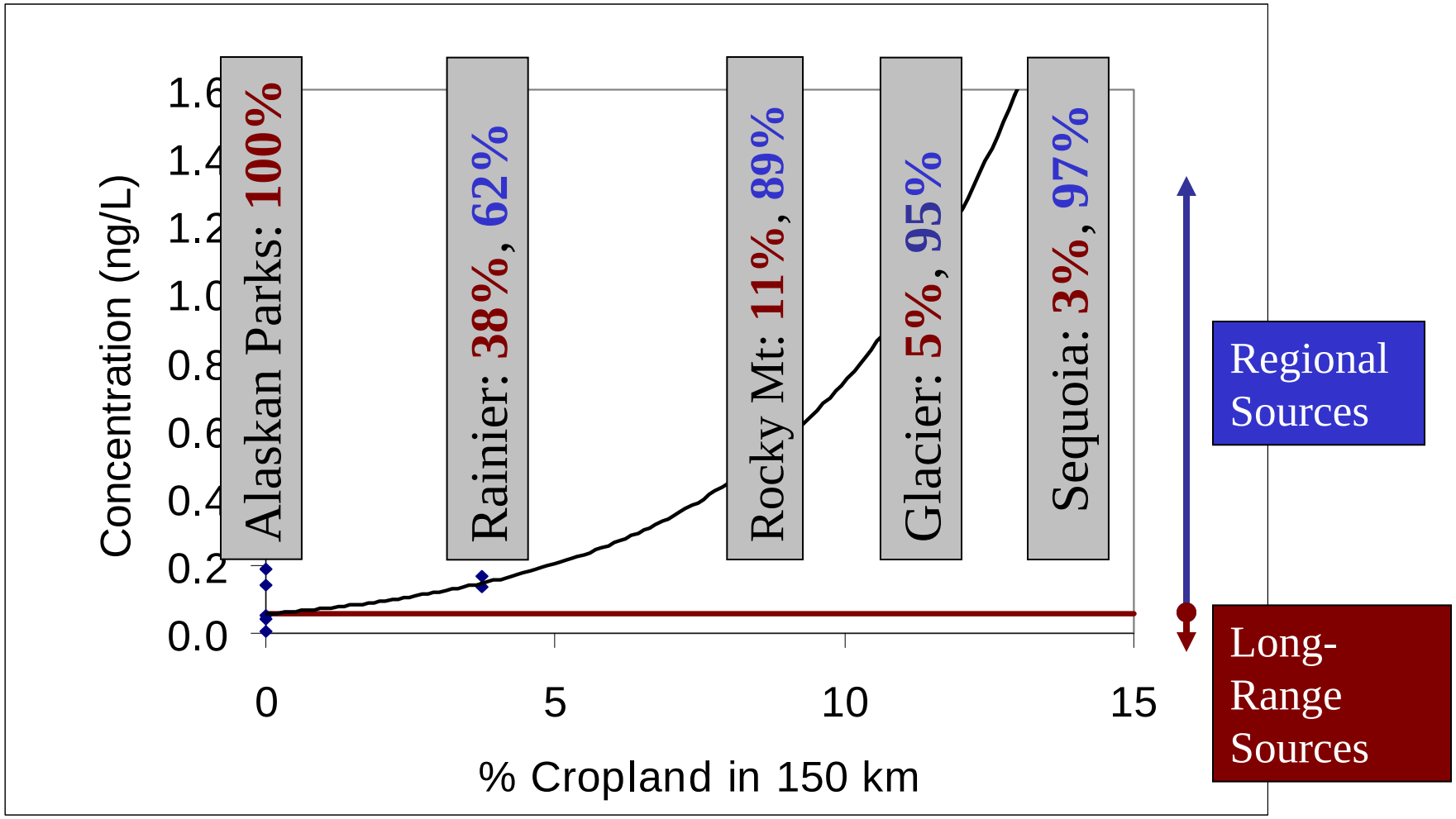
One day “Airshed” for Glacier



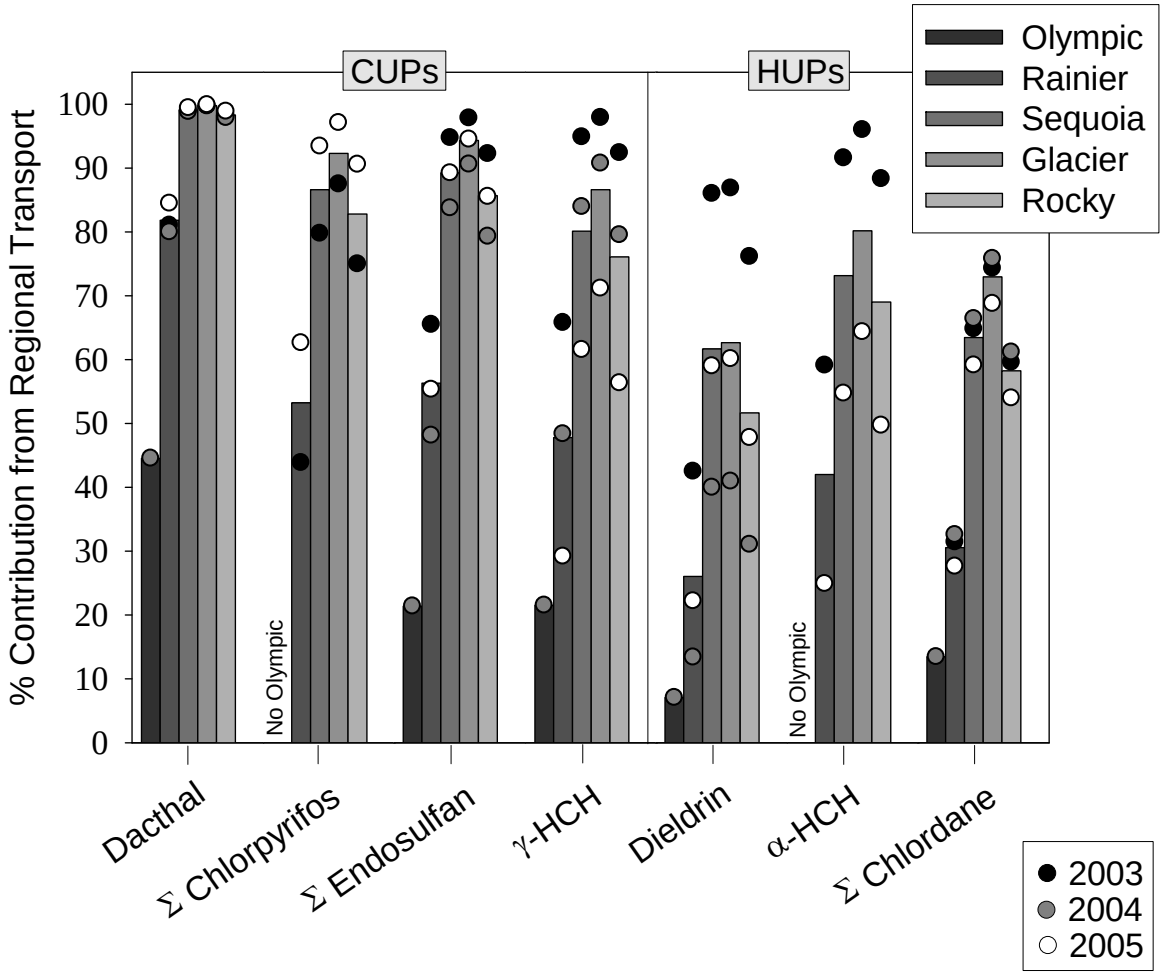


The “Airshed” for the primary WACAP parks were calculated for 1,5 and 10 days using the NOAA-HYSPLIT model based on the past 8 years of meteorological data. These airsheds show where the air has been within the specified number of days and give useful information on transport of regional pollutants with short lifetimes (e.g. PM 2.5 or haze; see Hafner et al., 2007)

ENDOSULFANS – % Long Range vs. % Regional



CONTRIBUTION OF REGIONAL SOURCES TO PESTICIDES IN SNOWPACK



- DENA, GATES, NOAT, OLY, and MORA have greatest long-range transport contribution
- GLAC, SEKI and ROMO have greatest regional transport contribution
- CUPS more likely from regional sources
- HUPS from long-range sources as well as revolatilization from historically contaminated soils