Wind Flow Prediction for IP3 basins

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- Overview

- Objectives

- Approaches

  - Case of study

  - Numerical Model

- Example of applications in

  IP3 basins

- Status and next steps

- Wind speed, turbulent transfer and wind flow direction are crucial for many IP3 processes
  - Blowing snow, intercepted snow unloading
  - Snow/ice turbulent transfer before and during melt
  - Evaporation, soil thaw
- IP3 Basins are complex terrains and so require mesoscale prediction of wind fields
- This presentation will focus on current efforts to use the MEC system to predict wind flow over Trail Valley Creek and Wolf Creek.

• Relationship between topography and windflow. Are there preferred regions of convergence, divergence, acceleration, deceleration, flow separation?

• Evaluate the sensitivity of the GEM model wind field outputs to initial conditions

•Demonstrate GEM for IP3 basins

- **Measurements and Numerical Model simulations will be used to address the objectives**

Comparison of simulations	VS	●Measurement campaigns
		●Small scale models

Case of study:

- Trial Valley Creek (68° 44' N, 133° 29' W):

    tundra plateau (flat); 68Km^2; forest-tundra transition

    10 March 1998

- Wolf Creek (60° 31' N, 135° 7' W):

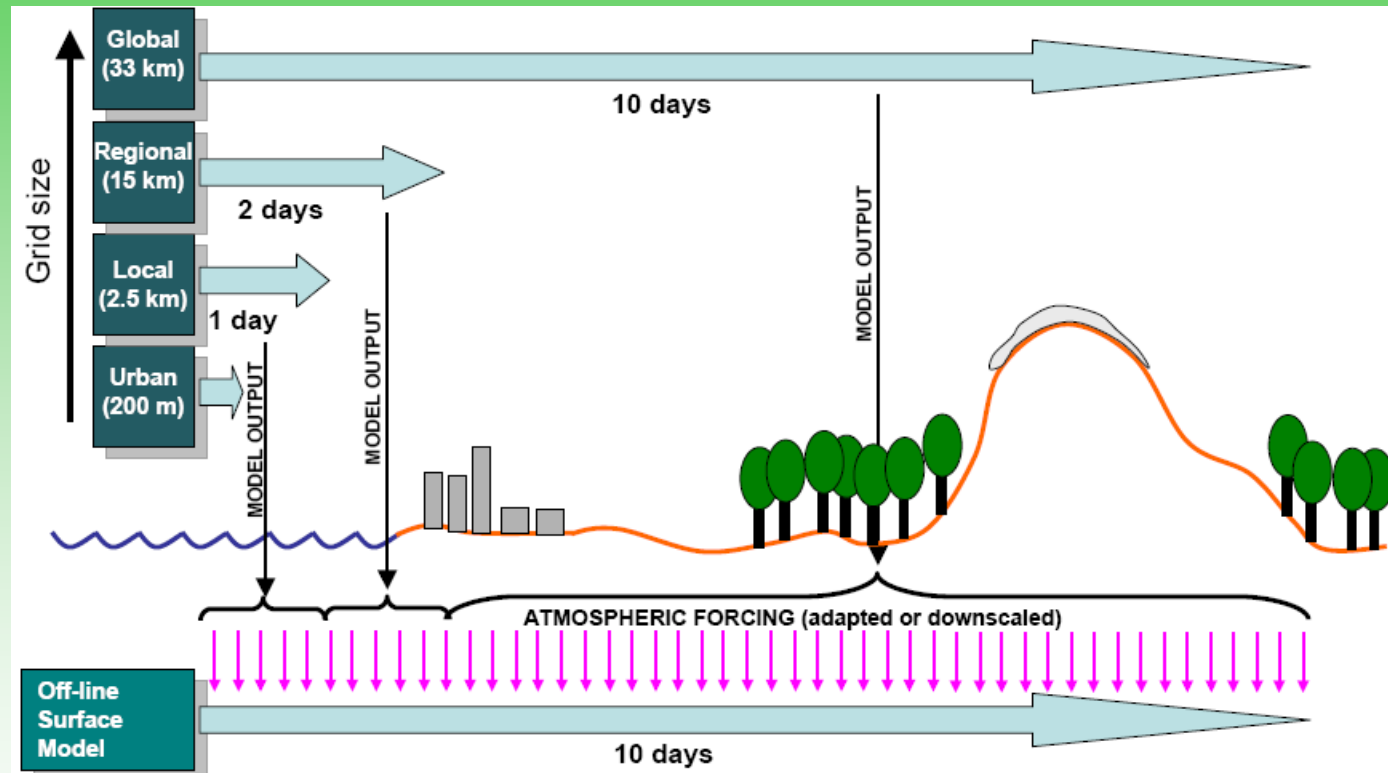   low mountain; 200Km^2; tundra plateau, valley shrub-

    tundra, lowland forest; 10 February 2001

Numerical Model: MEC (Environmental Community Model)
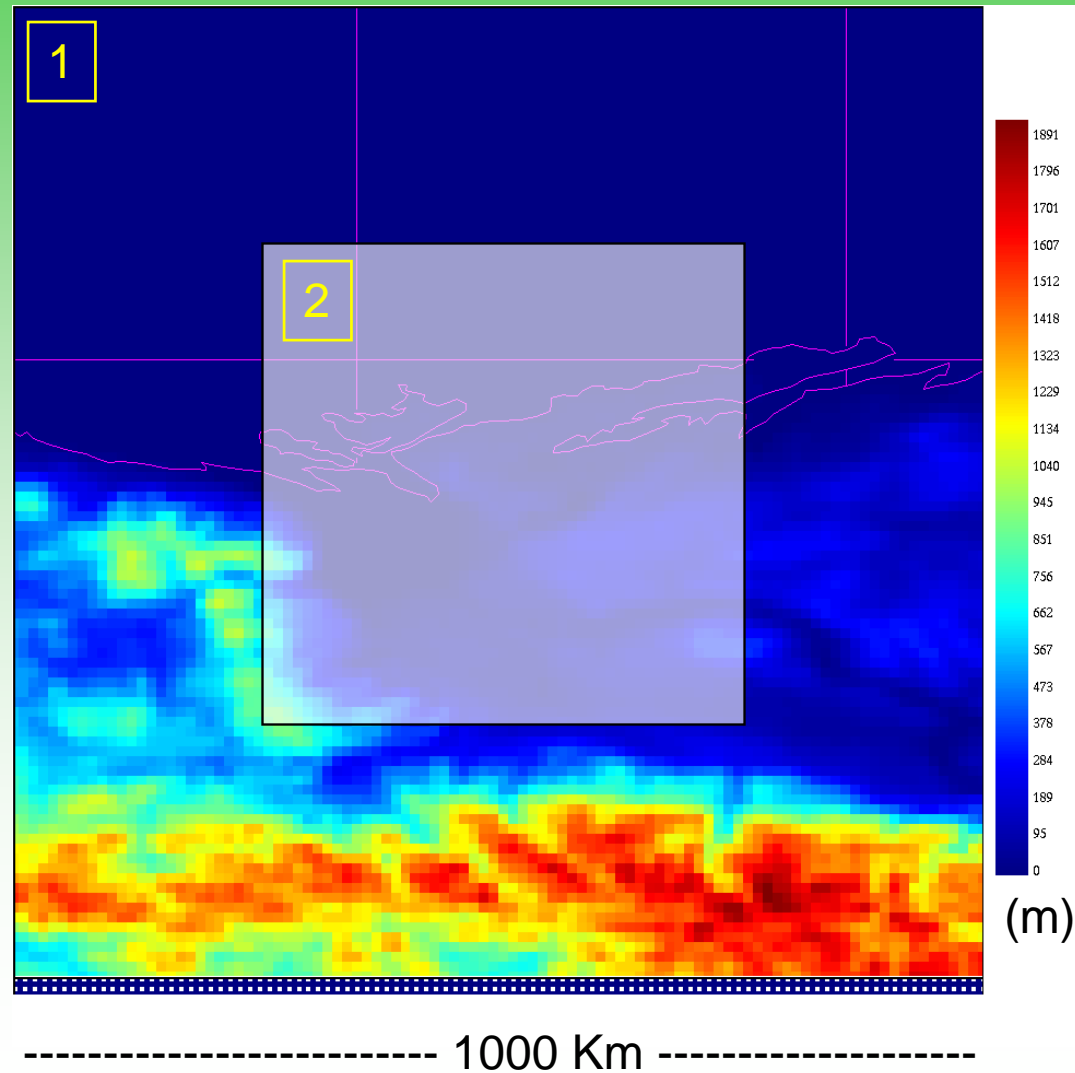

(from Belair et al.)

Trail Valley Creek

1 Period : 01/03 - 10/03 1998 00 UTC
Grid 100 x 100, ΔX=10 km , Δt=300 s
Driver: NCEP Analyse
Topography fields: 24 km
Spin-up: 7 days

2 Period : 07/03 - 10/03 1998 00 UTC
Grid 100 x 100, ΔX=2.5 km, Δt=60 s
Driver : Grid 1
Topography fields: ?
Spin-up: 3 days

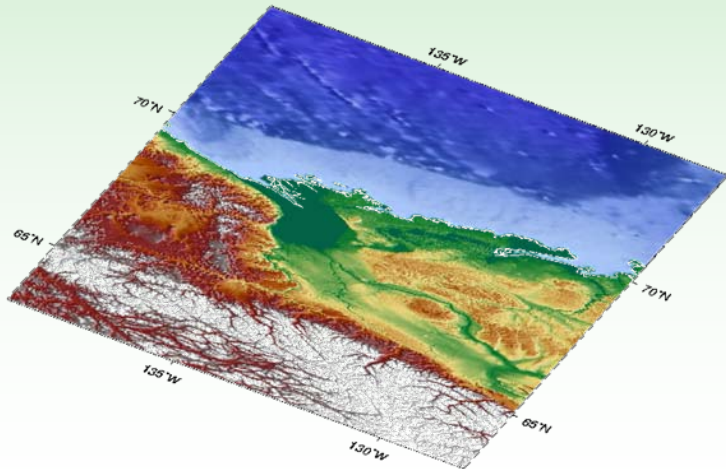Center: (68° 44' N, 133° 29' W)
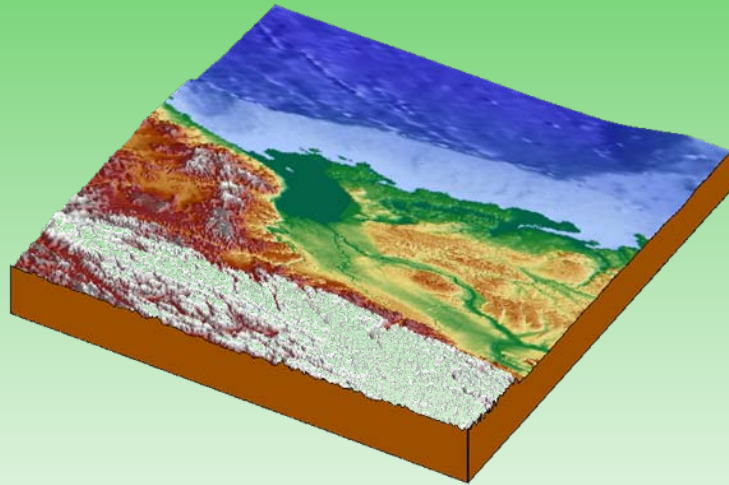
Conditions for March 10th, 1998

- Spin-up limitation
- One way nesting
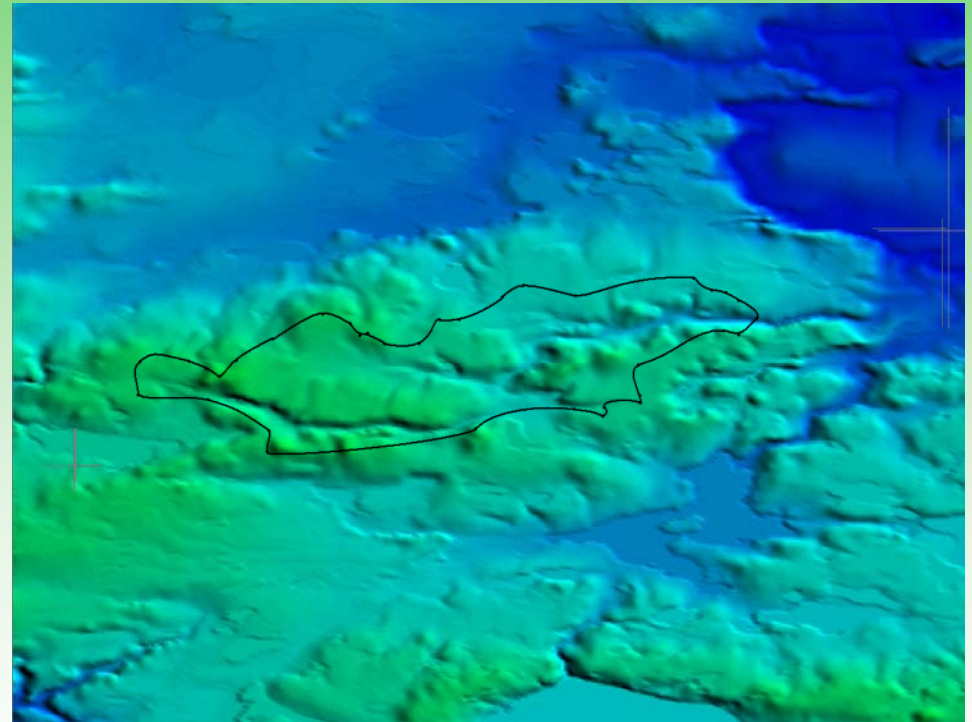- Wide range of circulation (all scales)

Mackenzie Delta Region, NWT

----------------------- 1000 Km -------------------

(m)

Mackenzie Delta
Current capability (30"~1Km)

Trail Valley Creek Domain
Objective to Model at this Resolution
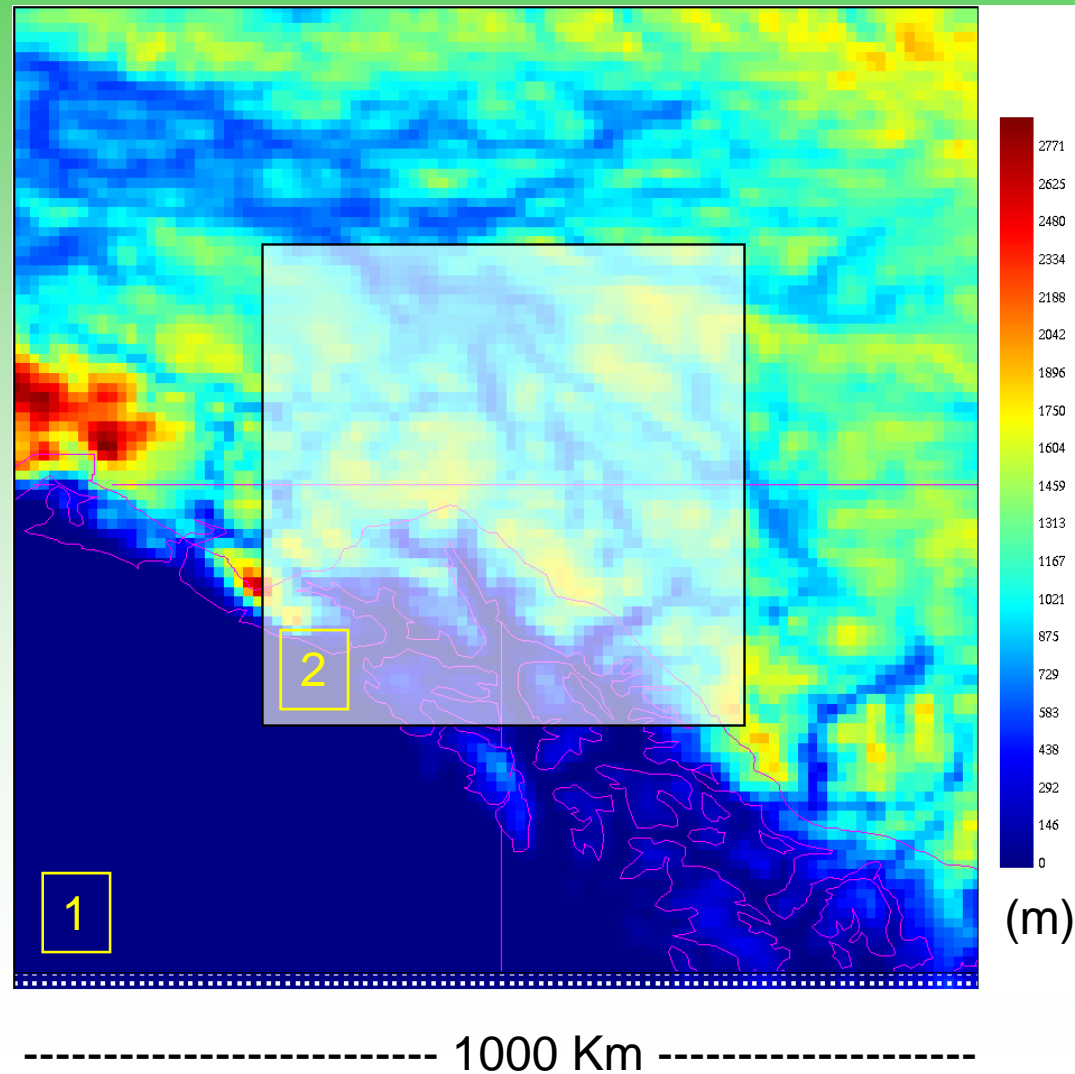### (3"~90m)

1 Period : 01/02 - 10/02 2001 00 UTC
   Grid 100 x 100, ΔX=10 km, Δt=300 s
   Driver: NCEP Analyse
   Topography fields: 24 km
   Spin-up: 7 days

2 Period : 07/02 - 10/02 2001 00 UTC
   Grid 100 x 100, ΔX=2.5 Km, Δt=60 s
   Driver : Grid 1
   Topography fields: ?
   Spin-up: 3 days

Center: (60° 31' N, 135° 7' W)

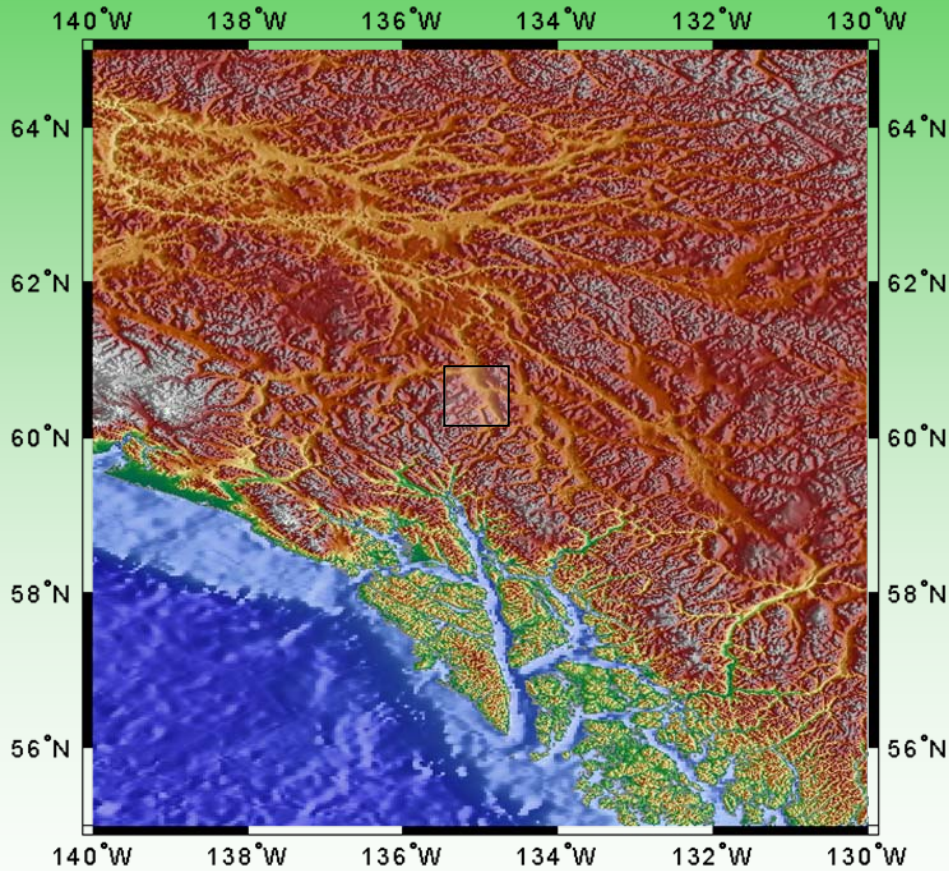Conditions for February 10th, 1998

- Spin-up limitation
- One way nesting
- Wide range of circulation (all scales)

(m)

------------------------- 1000 Km --------------------

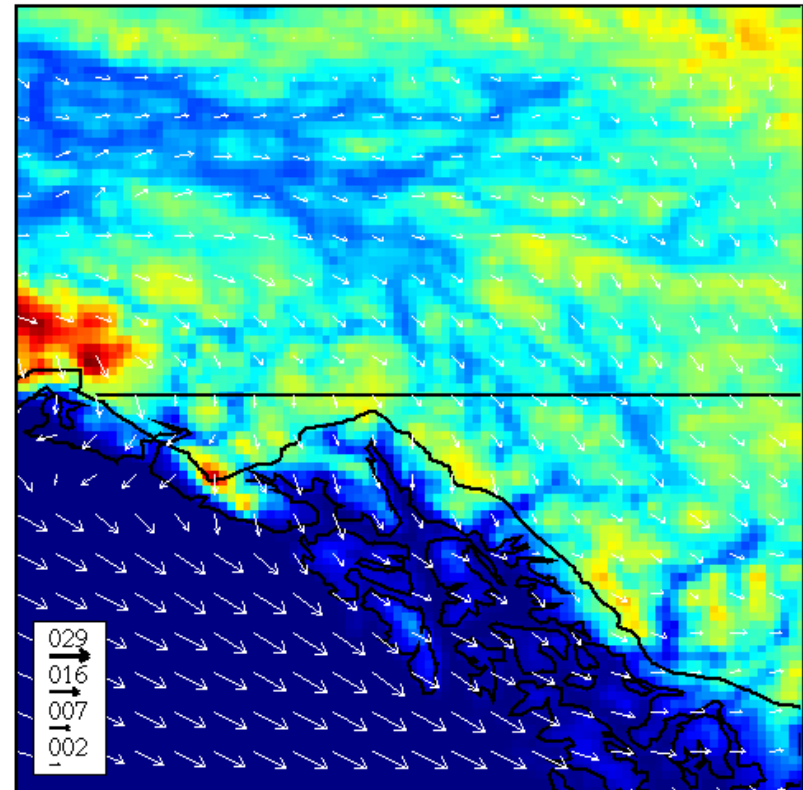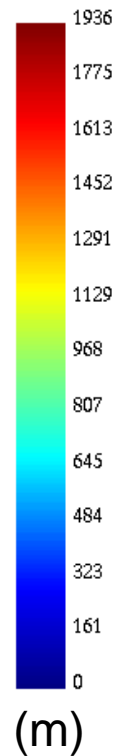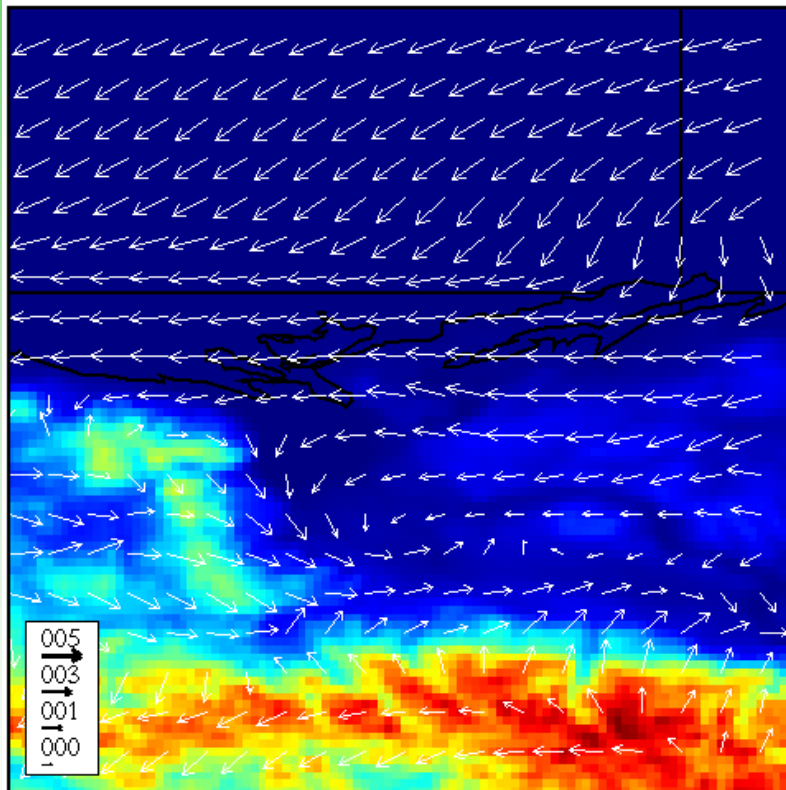# Wolf Creek

Current capability (30"~1Km)

Wolf Creek Domain (3/4"~22m)
Objective to Model at this Resolution
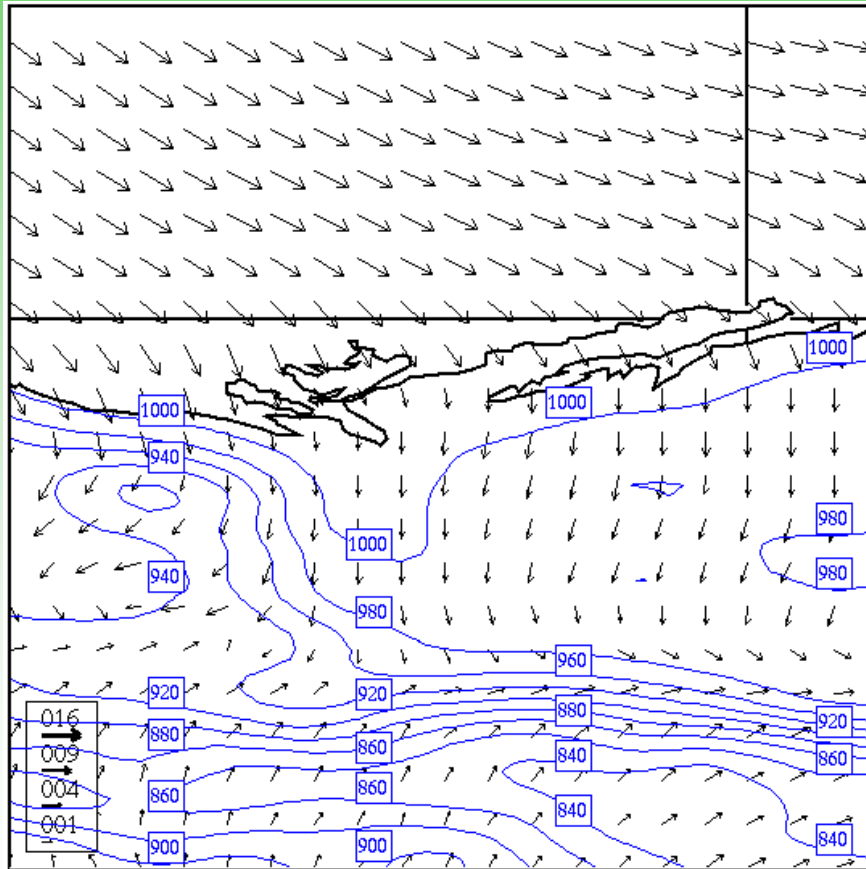
Examples of Wind Fields

Trail Valley Creek

Wolf Creek

Trail Valley Creek
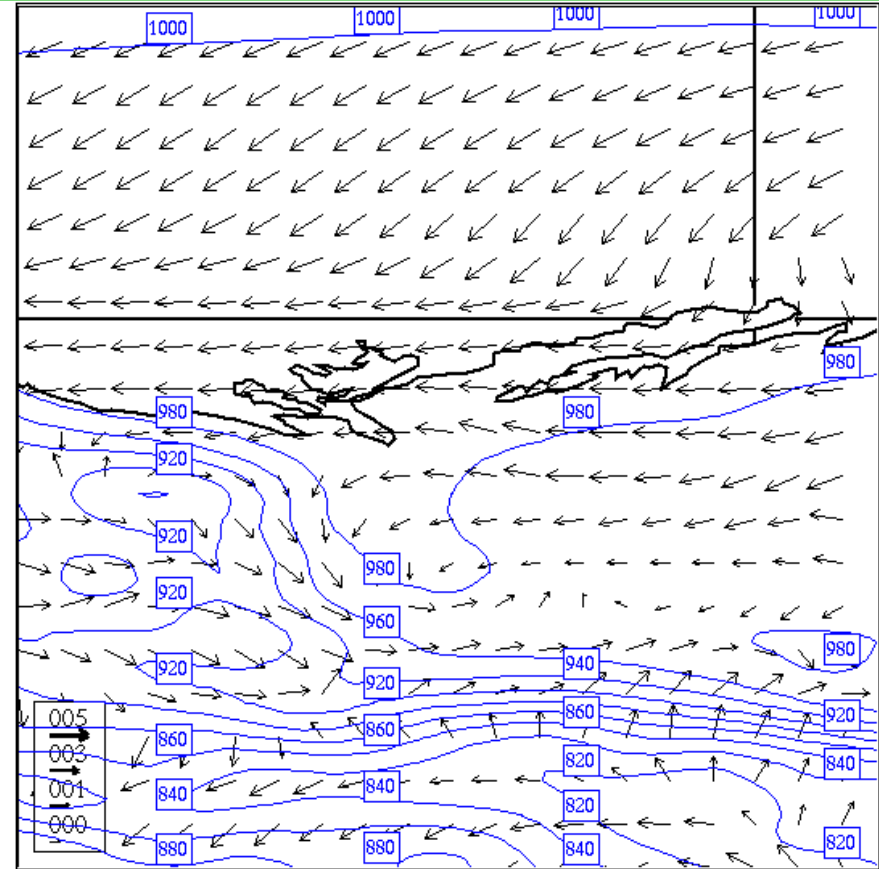
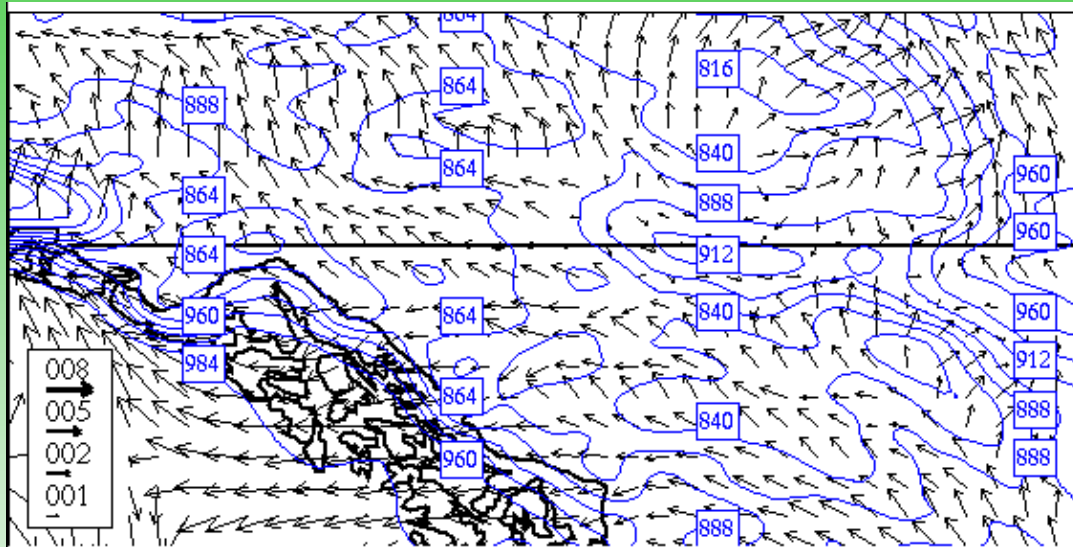## Synoptical Conditions (P0, UU-VV)

Observations

Simulation

Wolf Creek

Observations

Simulation
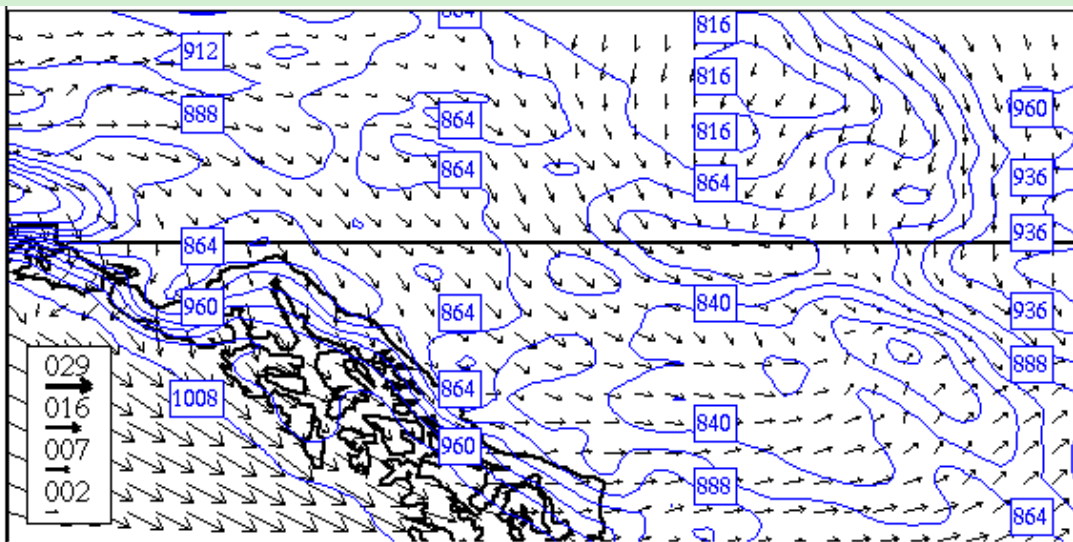
Status and Next Steps

- Possible to run GEM to produce wind fields over research basins
- Model produces reliable output for 10 days after initial conditions
- DEM at higher resolution required, coding issue
- Next Steps
  - Calculate wind fields at 2.5 km and 10 km length scale
  - Compare to basin observations of wind speed, direction
  - Use wind fields with process calculations of snow transport, snowmelt, evaporation, soil thaw and compare to basin observations