GAP FLOW AND VERTICAL MIXING AT THE SOUTHERN END OF THE GSL BASIN DURING VTMX

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NCAR

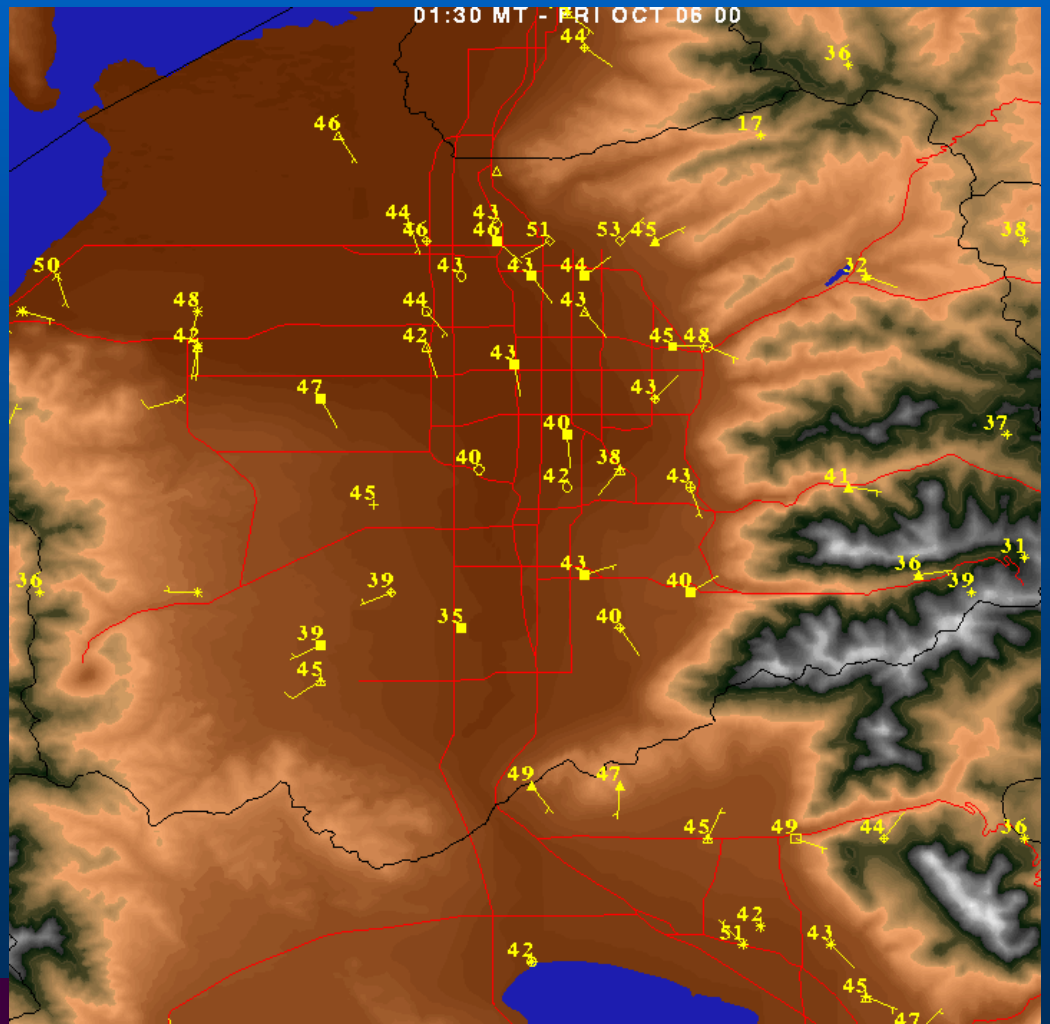
Gap Flow Depicted in Surface Winds

06 Oct 2000

- Down-valley flow channeled through the Jordan Narrows

- Influenced by other thermally induced circulations (e.g. lake breeze).

- Results in localized areas of convergence, vertical transport and mixing.



Gap Flow Events during VTMX

Typically commenced ~4 hours after sunset, end time more variable.

Gap flow events varied in duration, strength and depth.

Influenced by synoptic conditions.

Table 1. Gap flow Characteristics

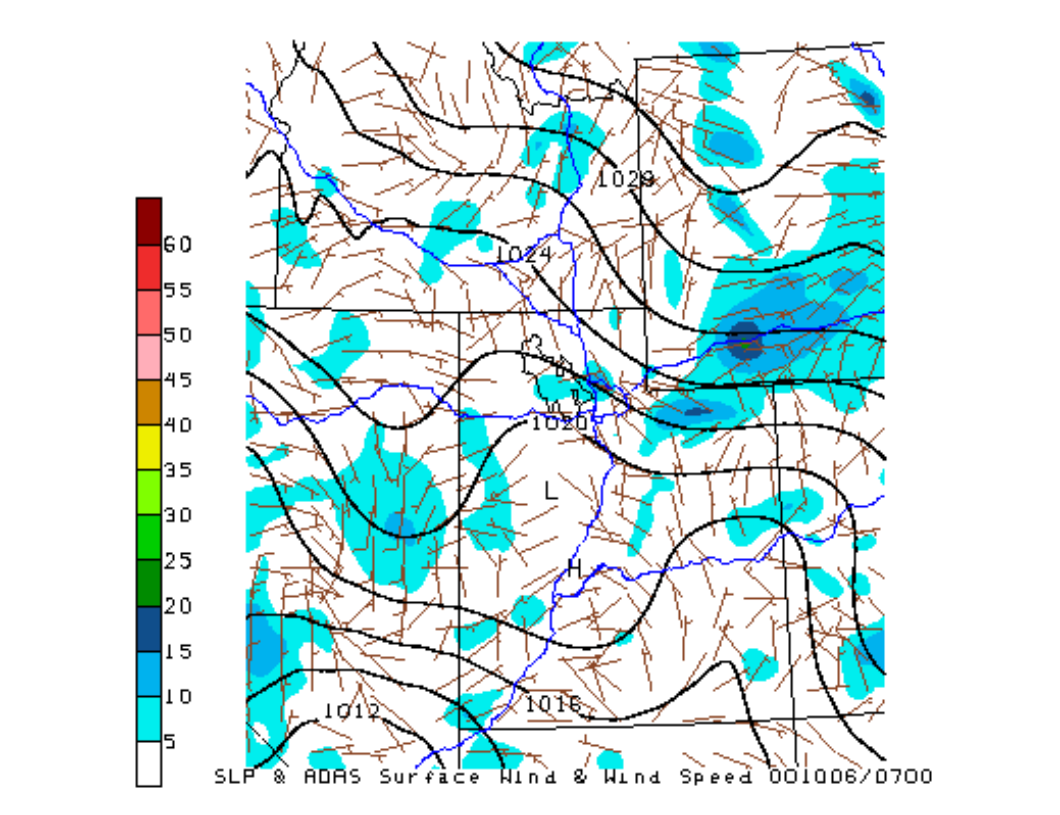
Date	Start/Endtime, UTC	Depth, m	Strength*, m s-1
10-4	0400-1600	300+	2.0
10-6	0500-1930	300+	3.0
10-7	0600-1500	**560**	1.2
10-8	1015-1500	100	0.7
10-9	0430-0000	1250	4.8
10-15	0415-2215	940	3.3
10-16	0415-2230	400+	4.7
10-17	0430-2200	1130	4.0
10-18	0400-0100	760	5.3
10-19	0400-1800	400+	5.6
10-20	0415-1500+	810	1.8
10-24	0430-0000	400+	4.5
Avg, N=12	0500-2015	100-1250	3.4

*mean wind speed at 10 m during gap flow event

Synoptic Summary: Steady Event

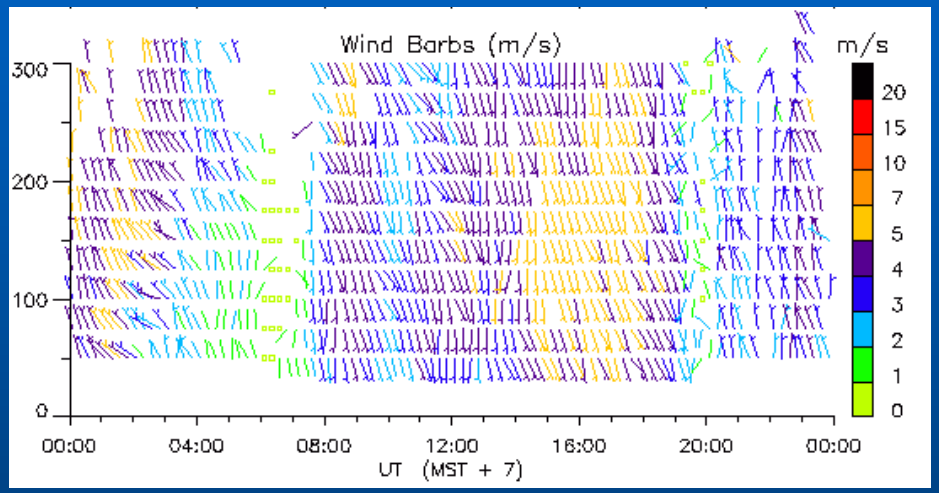
ADAS Data: 06 Oct 2000 (0700 UTC)

- Strong high well to the north.
- Weak trough over SLV



Steady Gap Flow Event

Sodar Data: 06 Oct 2000

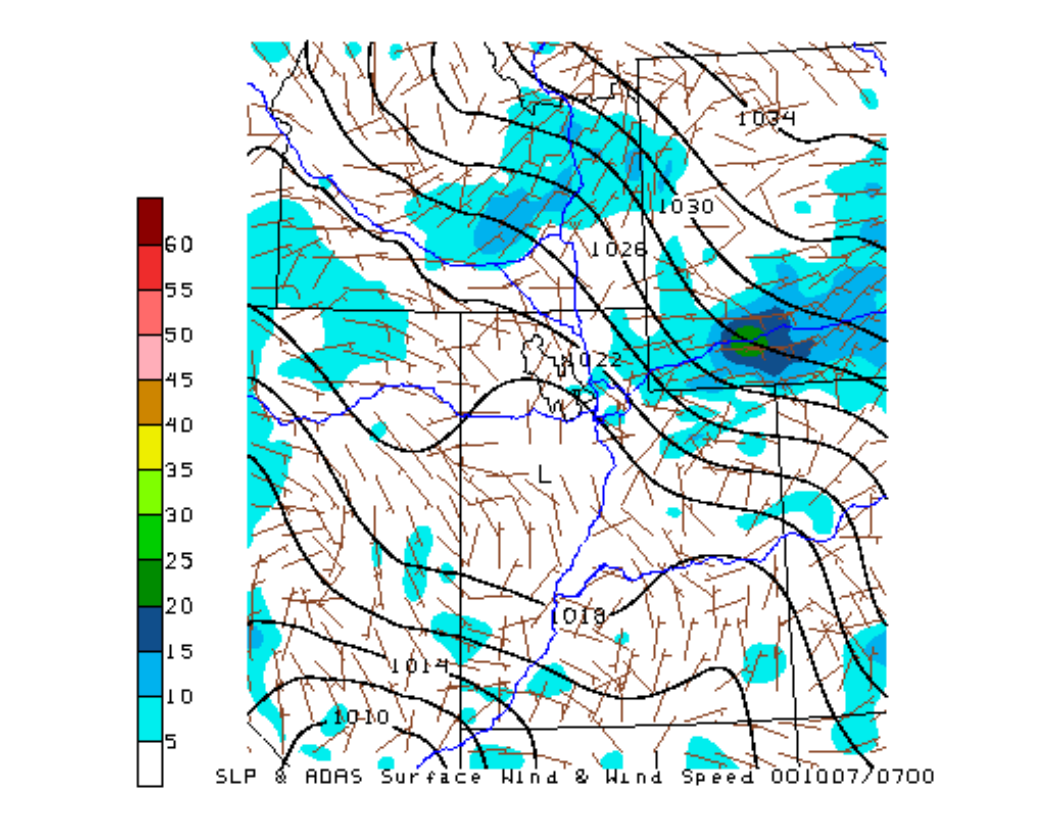


- Onset around 0600 Z.
- Intensity increases with time.
- Persists well into morning.

Synoptic Summary: Pulsing Event

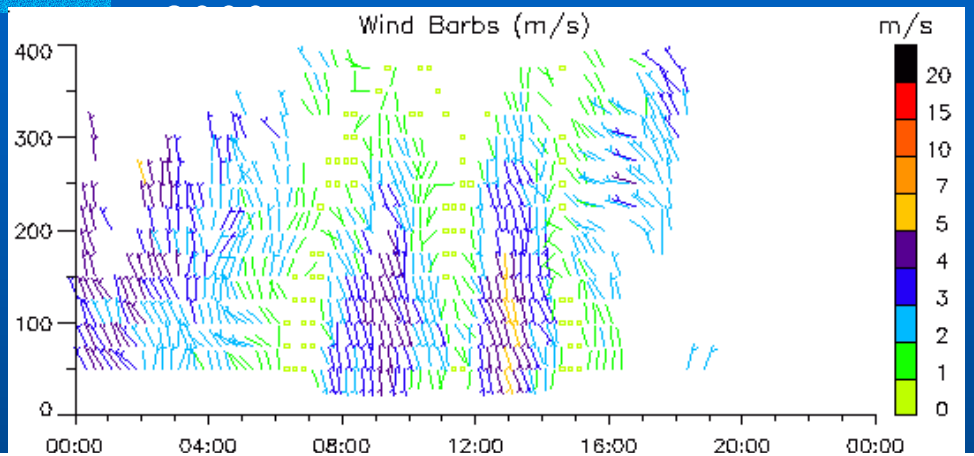
ADAS Data: 06 Oct 2000 (0700 UTC)

- Strong High moving in from the north.
- Weak trough further south of SLV

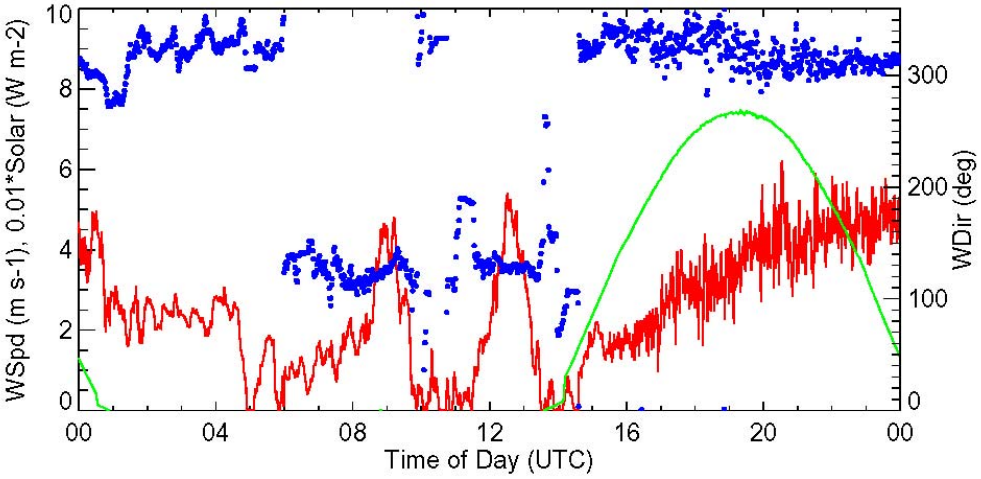


Intermittent Gap Flow Event

Sodar and Tower Data: 07 Oct

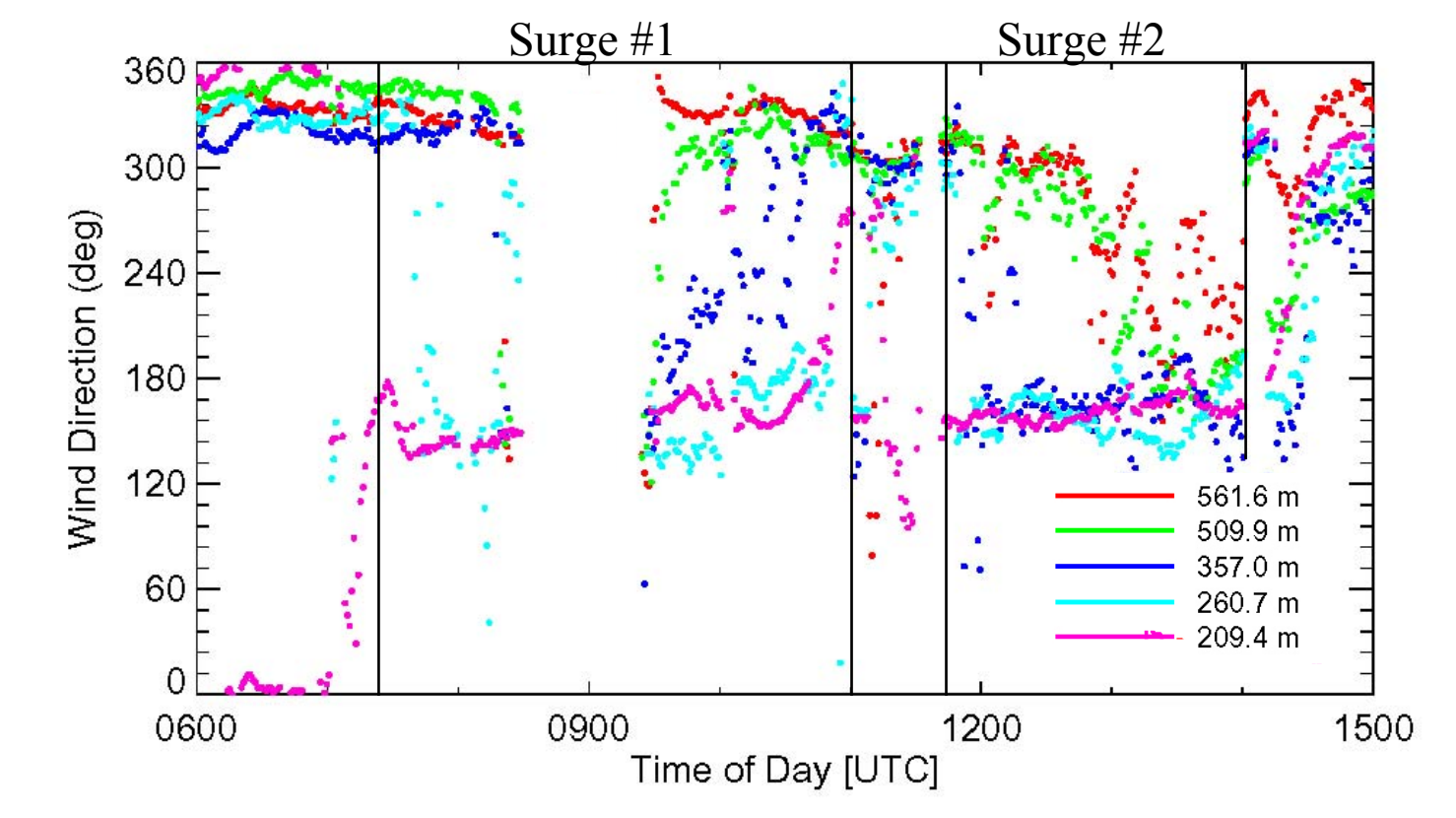


- Onset around 0600 Z
- Variations in depth and strength of flow.
- Cessation occurs at sunrise as valley flow reverses.



Vertical Extent of Gap Flow

TAOS DATA: 07 Oct 2000



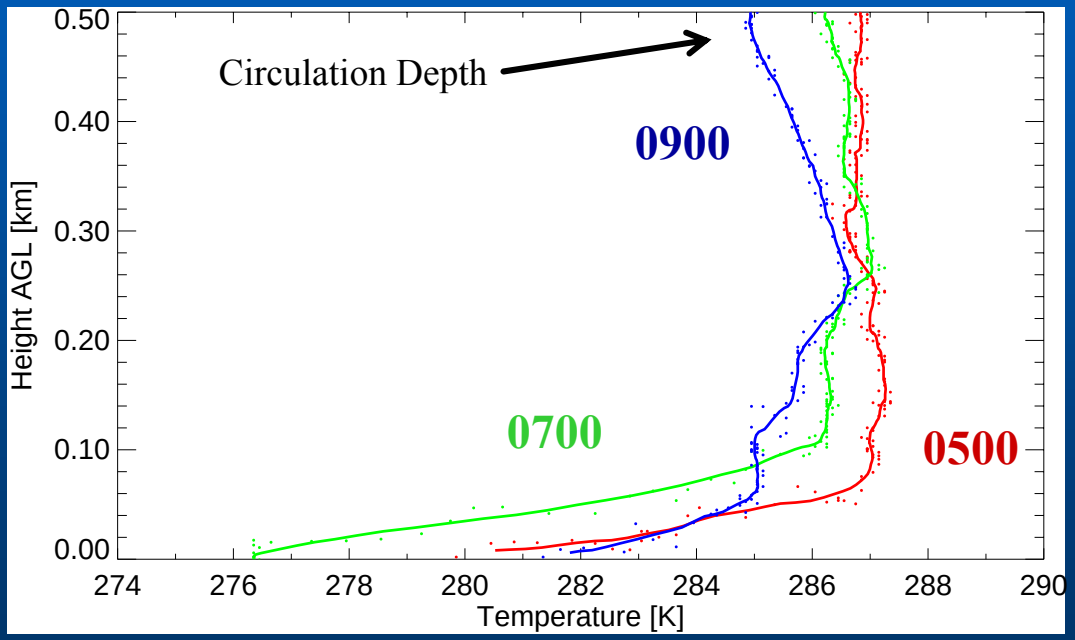
Gap Flow: Thermodynamic Effects

2-hourly soundings from NCAR ISS.

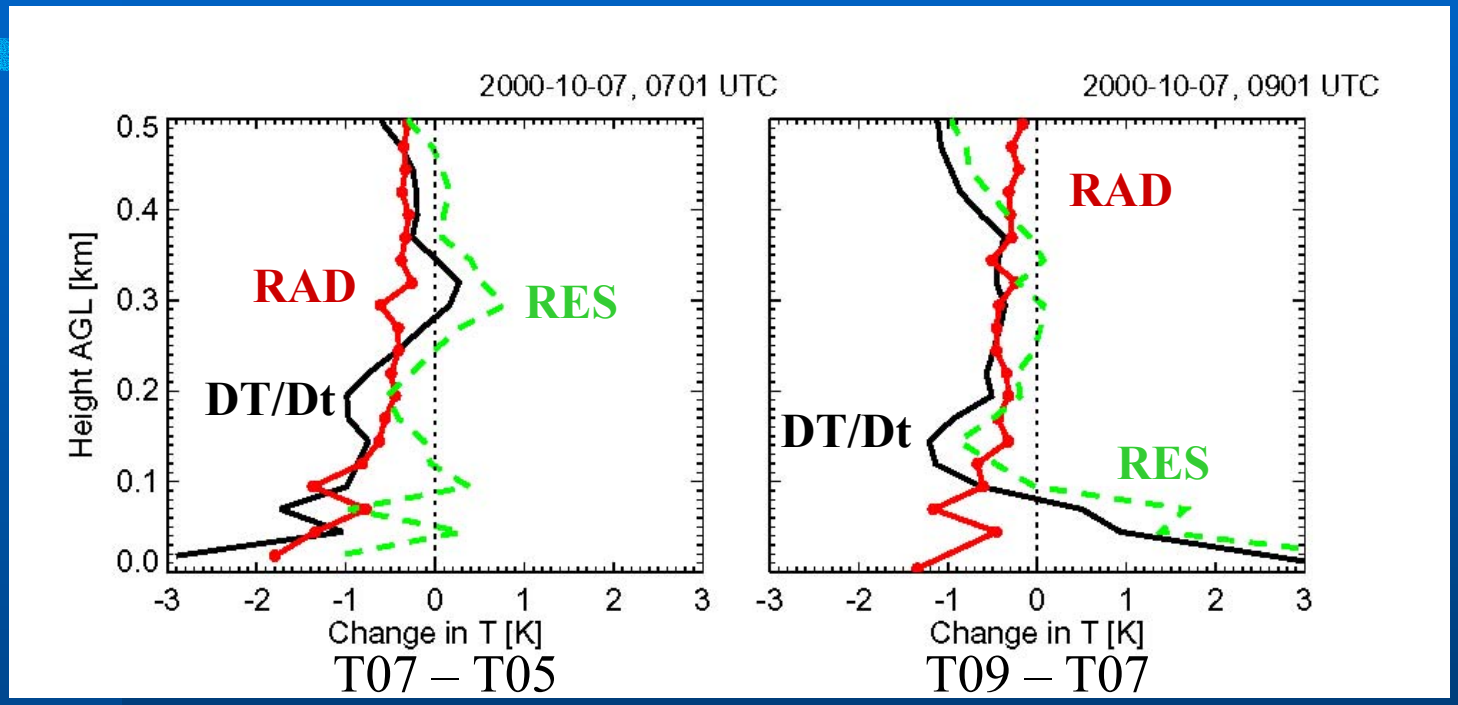
Initially, strong sfc-based inversion strengthens.

Mixing decreases low-level stability.

NCAR ISS GLASS: 07 October 2002



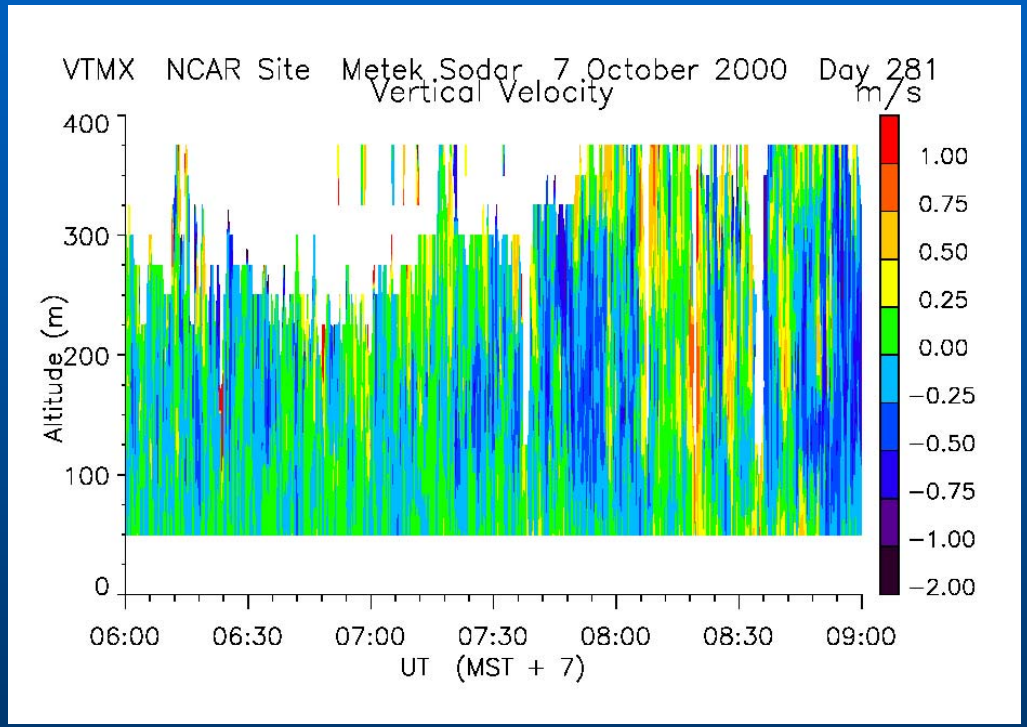
Heat Budget Profiles during Gap Flow



- Prior to gap flow, ΔT can be related to rad cooling.
- Strong warming at sfc after onset of gap flow.

Vertical Mixing in Gap Flow

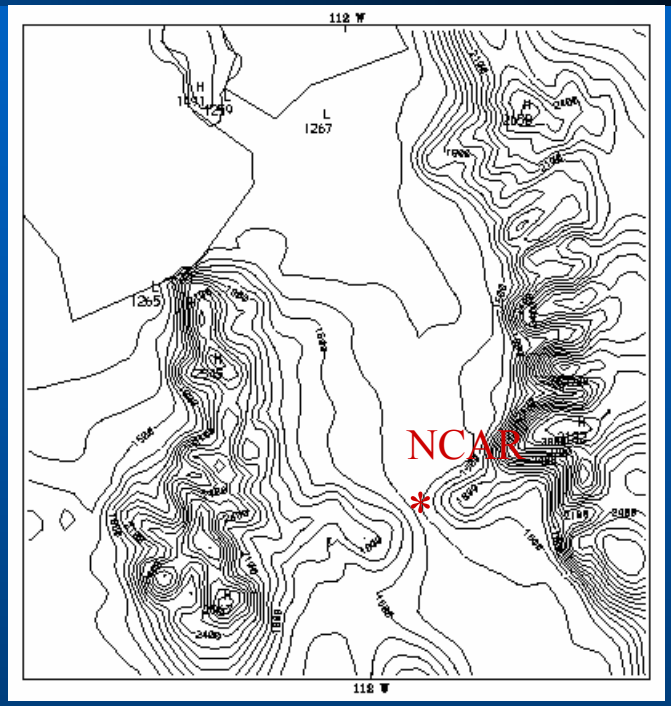
Surge # 1

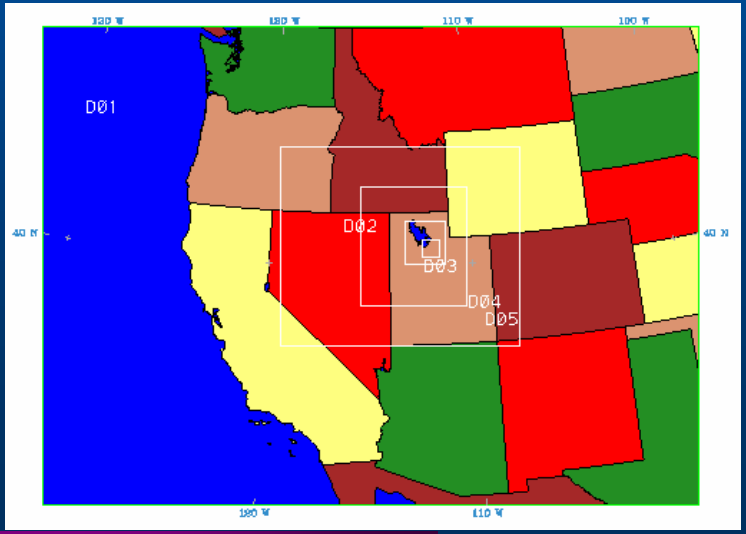


- Depth of signal increases with time.
- Upward motion along top of signal.
- Evidence of waves.

Simulation of Gap Flow

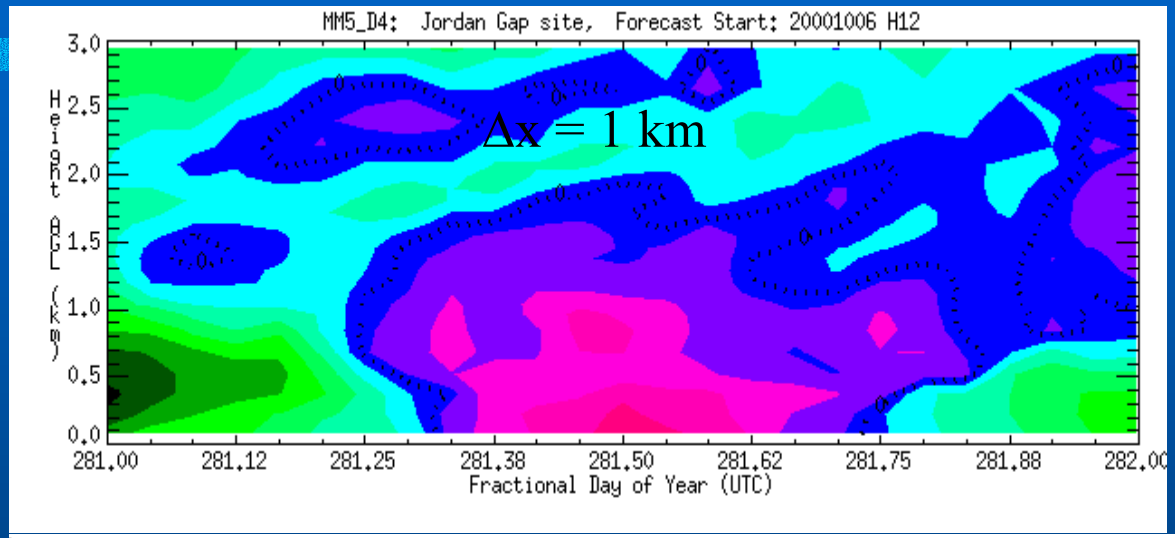
- Runs performed with MM5 using 5 concentric nests.
- Finest mesh resolution 1.1 km.
- 33 vertical levels w/ highest resolution just above sfc.
- 48 hour forecast using NCEP reanalyes.

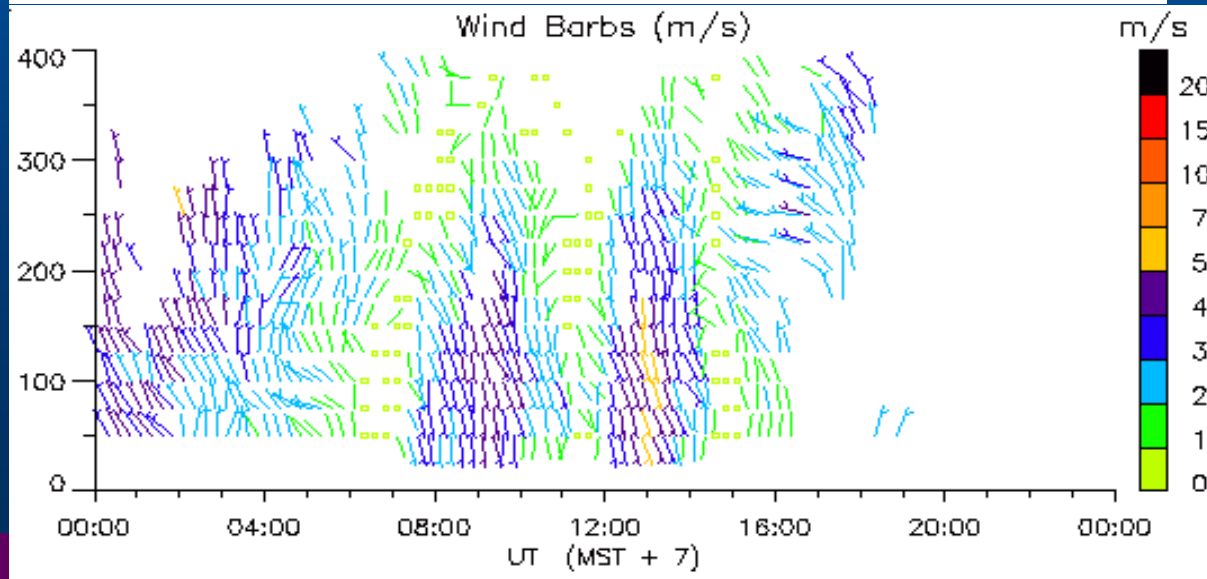




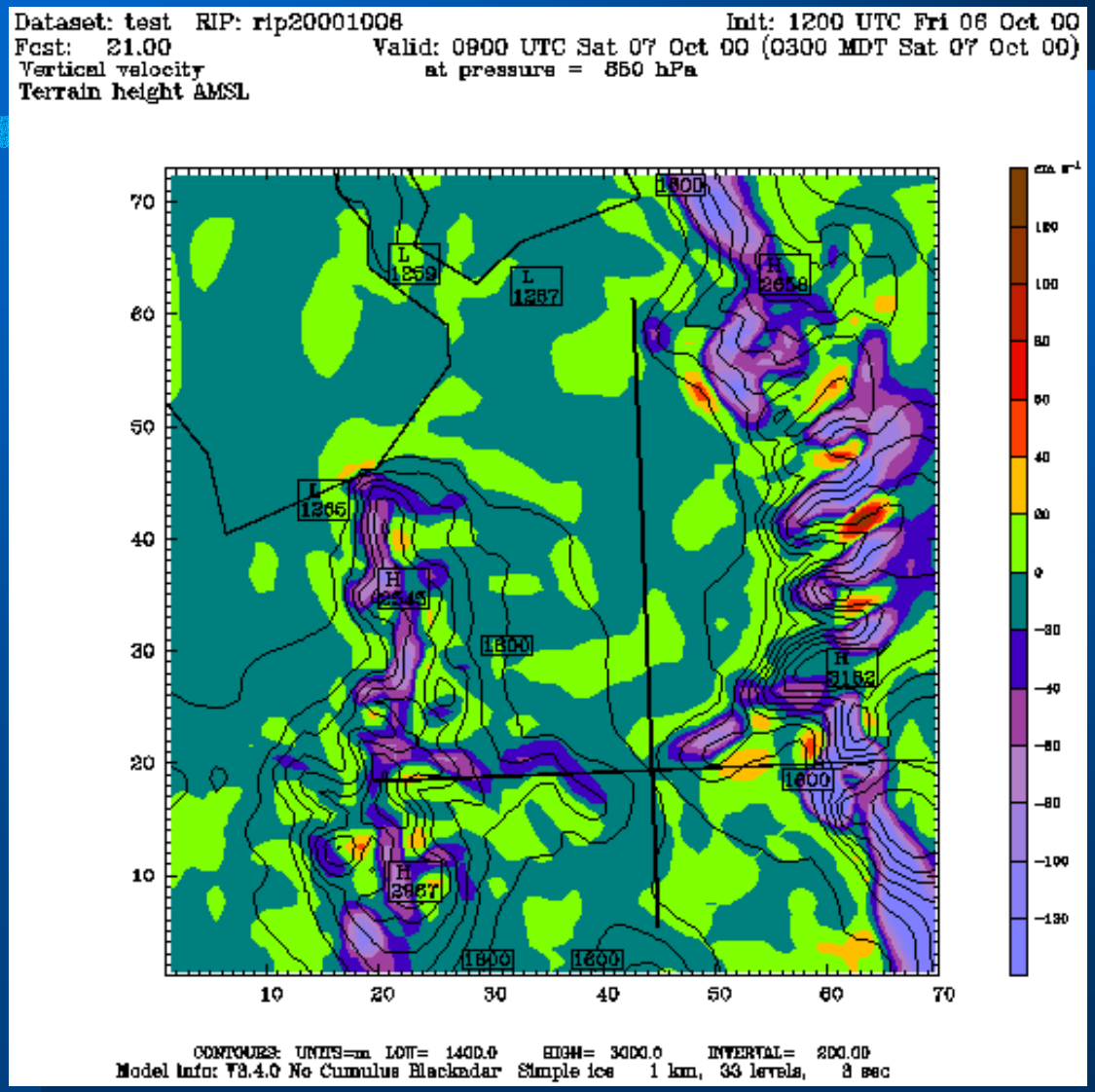
Simulation of Gap Flow V-Wind Profile

- Vertical extent and duration of gap flow too great.
- Increased horizontal resolution degrades simulation.





Horizontal distribution of Vertical Velocity



Conclusions

Suite of sensors deployed as part of an “Enhanced ISS” by NCAR captured the evolution of a number of gap flow events during VTMX.

Gap flow plays an important role in vertical mixing at the southern end of the GSL Basin.

Mesoscale model captures flow reversal and depicts associated regions of vertical transport, but depth overdone. In the future we will test the effects of increase vertical resolution, lake temperature, bl schemes on the evolution of the gap flow.