Experiences with Creating Synoptic Case Studies Using IDV & RAMADDA

4-19-13

Hardware/Software

- Dual boot Windows/Linux, IDV works equally well on both, 2.x GHz with 8 GB RAM

- IDV version 3.0u2

- RAMADDA version 1.4

- Data served from same server that runs our LDM:
  - 12 cores at 2.8 GHz, 32 GB RAM, SAS drives

6 different case studies

1. March 1993 Storm of the Century
2. November 1998 Upper Midwest cyclone
3. February 2003 East Coast Snow/Ice Storm
4. November 1998 Event with a focus on isentropic analysis
5. March 1993 Event with a focus on jet streak circulations and potential vorticity analysis
6. January 2003 Missouri snowstorm

- Most from COMET Case Study Archive, but not all
  - All data locally served

CMU Meteorology RAMADDA Server

RAMADDA **Top | Search**   **Login | Data Cart | Help**

📁 **Top**   Layout:

File | Connect | View

Entries ▸

▸ 📁 Weather Data	2012/08/24 14:58 UTC
▸ 📁 IDV Bundles	2012/08/23 22:13 UTC
▾ 📁 Courses	2012/08/23 22:13 UTC
▸ 📁 MET 312	2013/01/18 15:35 UTC
▾ 📁 MET 345	2013/01/16 17:56 UTC
▸ 📁 03jan15	2013/04/08 21:19 UTC
▾ 📁 15feb03	2013/01/16 17:56 UTC
▸ 📁 Images	2013/01/22 23:25 UTC
▸ 📁 Movies	2013/01/18 18:22 UTC
▸ 📁 Satellite	2013/01/16 21:09 UTC
▸ 📁 Radar	2013/01/16 21:09 UTC
▸ 📁 Observations	2013/01/16 21:09 UTC
▸ 📁 Model	2013/01/16 21:09 UTC ▾
▾ 📁 Bundles	2013/01/16 21:09 UTC
▸ 🌐 Bundle 1	2013/01/22 23:43 UTC
▸ 🌐 Bundle 2	2013/01/22 23:43 UTC
▸ 🌐 Bundle 3	2013/01/22 23:43 UTC
▸ 📁 mar1993	2012/11/05 17:50 UTC
▸ 📁 98nov09	2012/10/18 19:25 UTC
▸ 📁 MET 450	2012/10/30 22:06 UTC
▸ 📁 MET 340	2012/09/22 15:01 UTC
▸ 📁 Users	2012/08/15 21:37 UTC

MET 345 Synoptic Meteorology II

The Use of Isentropic Fields in the Diagnosis of Heavy Banded Snow

Goal: To illustrate how satellite imagery, conventional analyses, and isentropic parameters computed from gridded model data can be used to diagnose the major processes contributing to heavy banded snowfall during a major cyclogenesis event.

Case Study: 9-10 November 1998: Cyclogenesis in the upper Midwest of the United States.

Handouts: Snowfall map with isohyets, analyzed surface maps

To start this case study, in either Windows or Linux, open the IDV

- Go to "Data Choosers" in the Dashboard, and type the following address in the box:

- http://waterspout.cst.cmich.edu:8080/repository/thredds/Top.xml

- In the tree, navigate to "Courses", "MET 345", "98nov09". From here you will answer the questions by loading in 3 different bundles from the "Bundles" directory. Each bundle contains tabs that you will click on for each question. The tabs will allow you to quickly examine multiple plots to help you answer each question.

Bundle 1

1. Look at the GOES IR satellite imagery for the period 00 - 18 UTC 10 November 1998.

    a. Relate what you see to the features seen on the surface analyses.
    b. How rapid is the cyclogenesis? (Be quantitative)
    c. Is this a bomb? Why or why not?
    d. At what point can you see the beginning of trowal development?
    e. Discuss the development of the "comma head."

2. Look at the GOES water vapor imagery for the same time period.

    a. Can you see the development of a dry slot?
    b. Where is the position of the dry slot with respect to the trowal?
    c. With what upper-level feature is the dry slot associated?

The exercises

- Students work in groups of 2 or 3 and typically save the working document in the cloud
  - RAMADDA not able to password protect files, so if case study answers are uploaded for storage in RAMADDA all students could access the group's answers when the catalog is loaded into the IDV
- Exercises take about 2 weeks
- Produce 5-15 pages of text
- Level of knowledge is at the advanced undergraduate level
  - Necessitates examination of derived quantities

Student Responses

- Positive:
  - Much improved over using GARP for case studies
    - Mainly due to the use of bundles – takes the "knobology" out of the exercise and increases time to do analysis
  - Overall students are pleased with the tool and I get few complaints or questions on how to work with IDV to do the case studies
    - They can answer the questions based upon what is in the bundle

Student Responses

- Negative:
  - Can't see cursor readout (from middle mouse) if multiple variables displayed, it is hidden
  - Problems with UNITS – non traditional units are sometimes used (eg, Pa vs hPA)
    - I should have clarified these in the bundle, but problems exist with real-time data as well
    - Units in cursor read out may be different from what is plotted?
  - Changing color tables is hard using AWIPS style editor
    - Something simpler could be devised (e.g., GEMPAK)
    - Complex interaction between color table editor and contour editor menu

Student Responses

- Negative:
  - Biggest problem is with cross-sections

- I make extensive use of the "Map and Transect" view
  - No cross sections in NMAP – can't use
  - This is the way I have students "slice and dice" the atmosphere
  - When an isosurface or a probe or a cross-section in the view is used, it is difficult for students to explain to me in writing, which is needed to assess their understanding

Left panel shows air in a tropopause undulation being advected over a sfc low
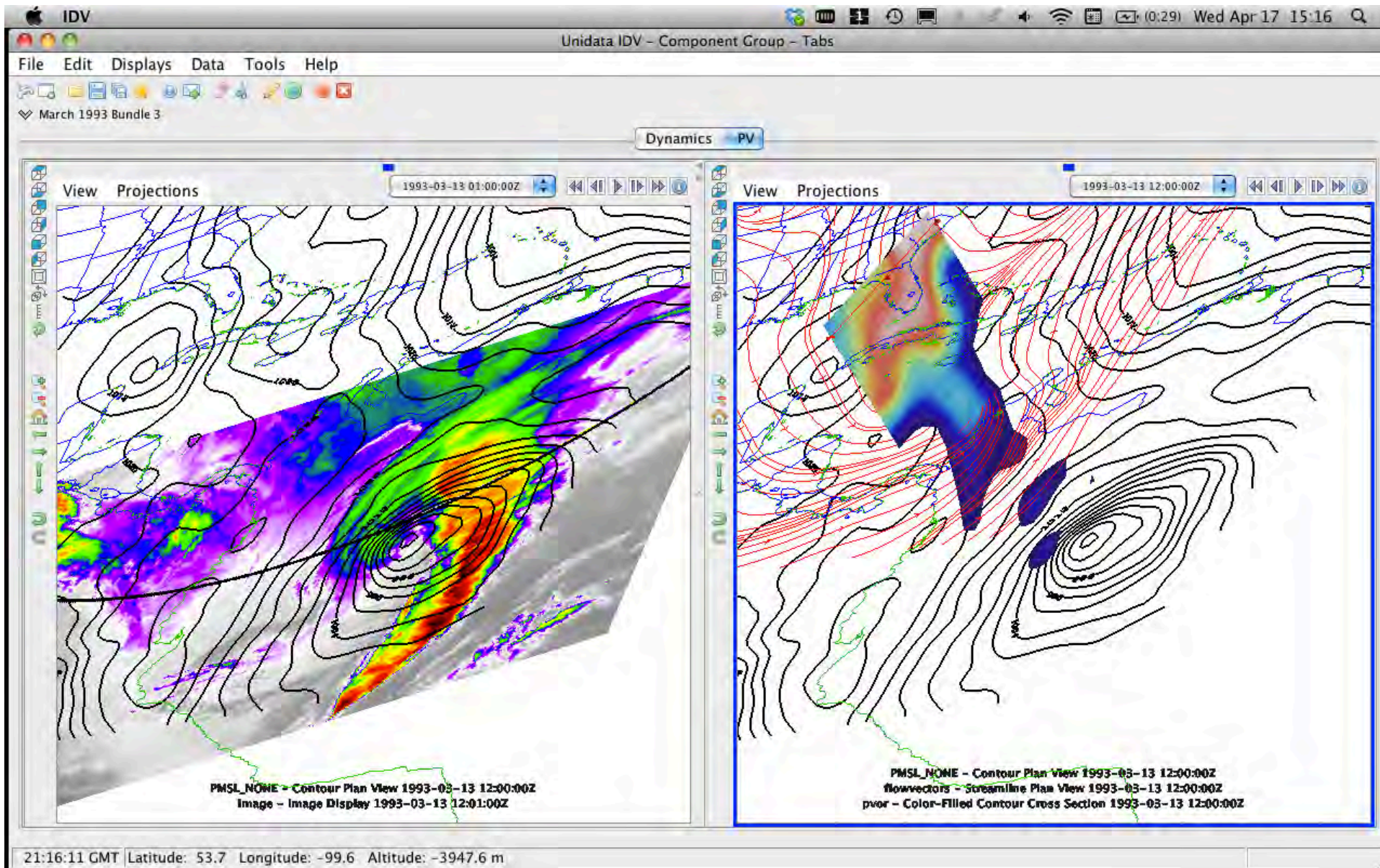
My experience as creator

- I was able to re-create the labs I had always done in GARP
  - Sometimes working with data in GEMPAK first was beneficial
- Time spent creating bundles was significant, already having case study questions created made things easier
- IDV's robust capabilities introduce the need for more creativity when building the case study – how will I most efficiently lead the students through the data to accomplish the learning objectives of the case study?
  - I liked working with tabs

My experience as case study creator

- Have a max of 10-12 machines hitting the server at a time, students did not complain of load times
- Having the data local makes a huge difference
- All of the data I used loaded quickly
- Memory upgrade from 2 or 4 GB to 8 GB was beneficial

Ground-relative vs. system-relative moisture transport vectors on the 300 K sfc
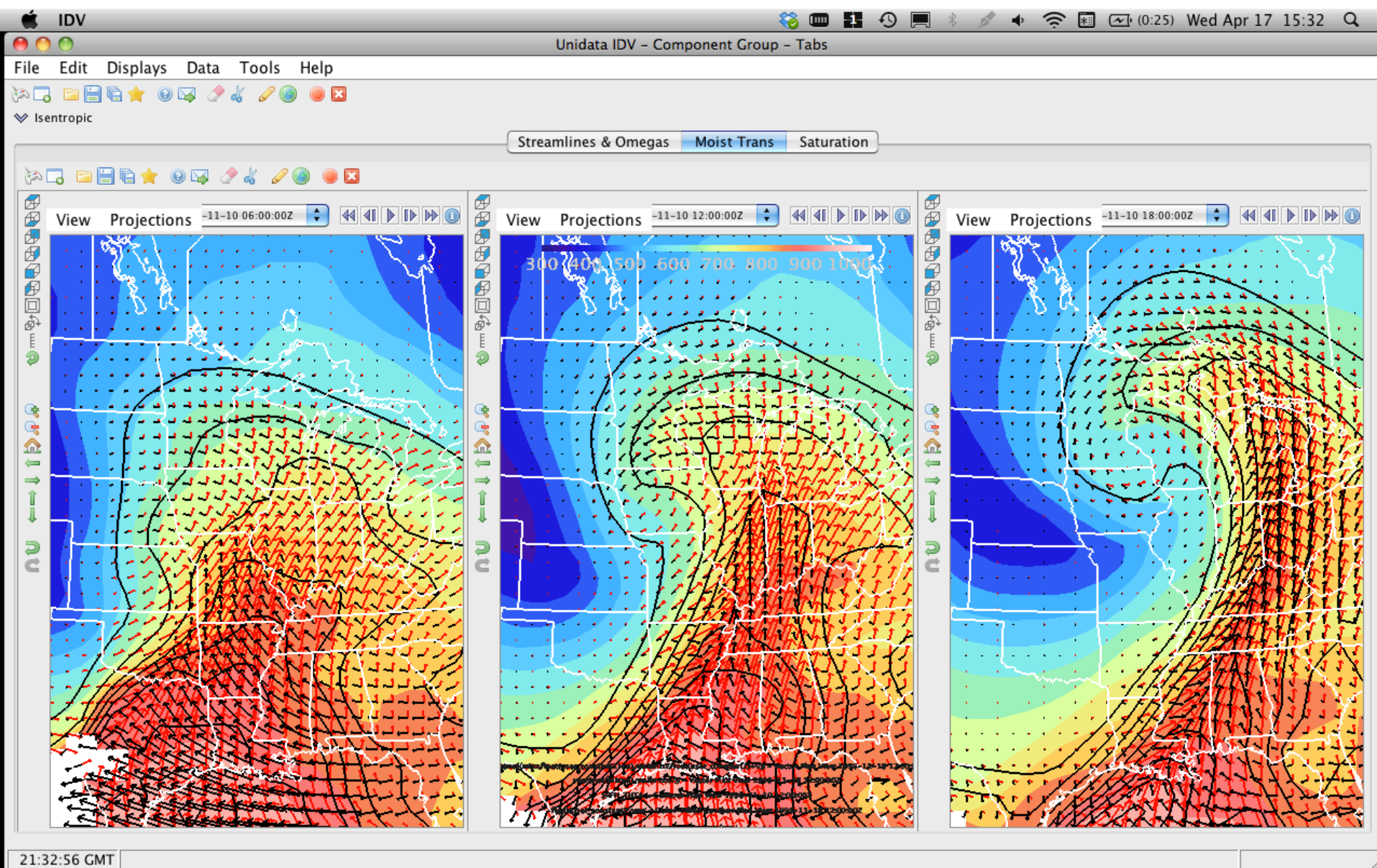
Left: 850 mb winds, temp advection
Right: 1000 mb winds, temp advection
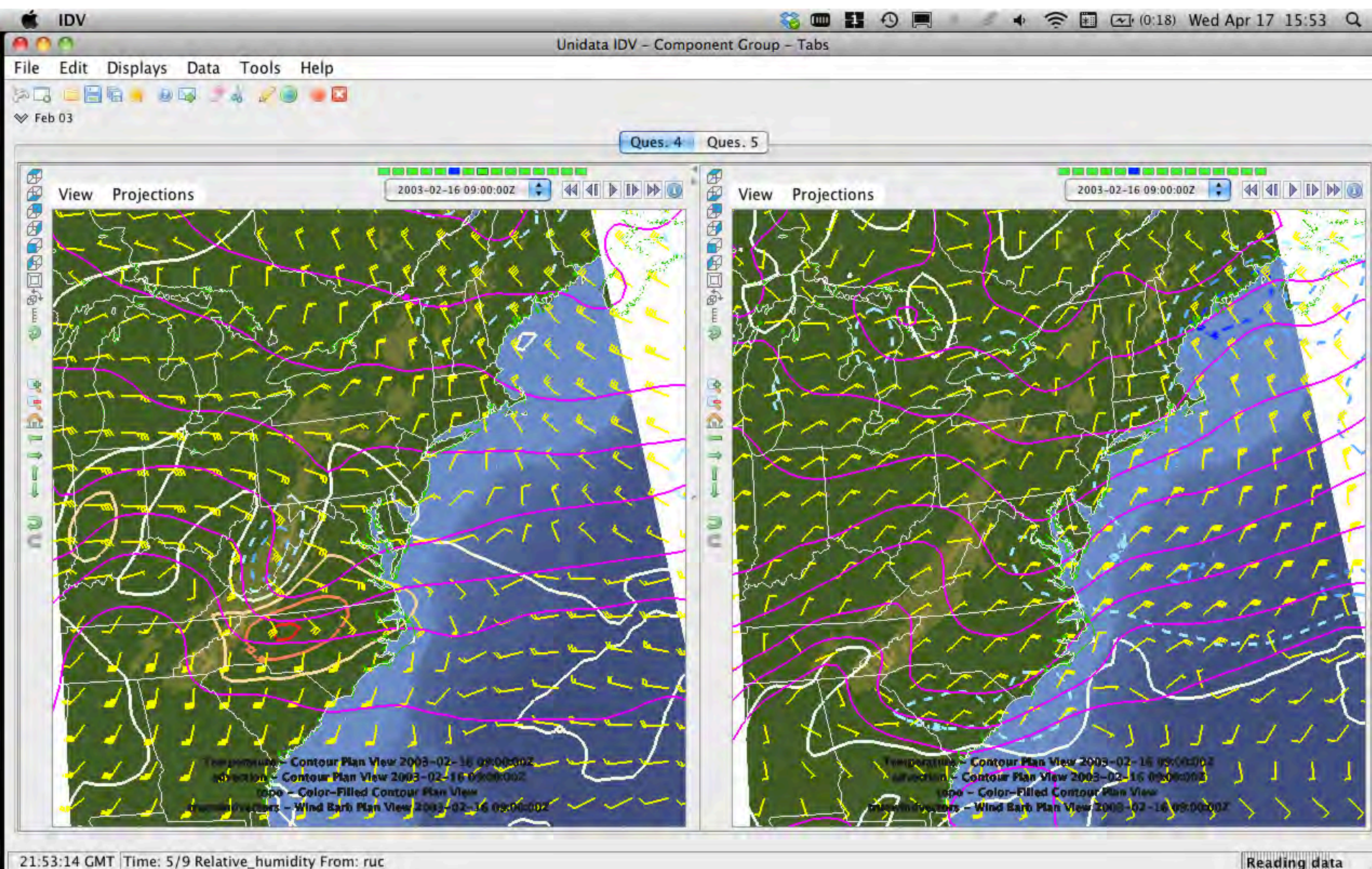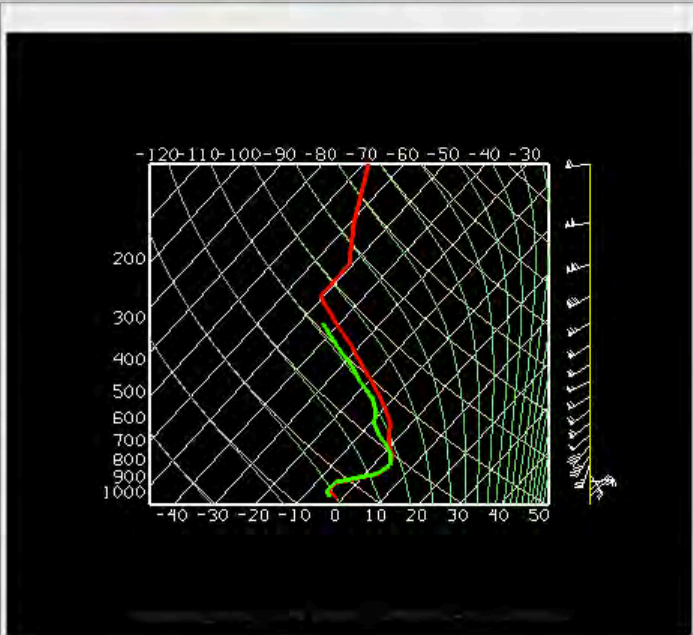
Move the red marker over each city to assess its vertical profile

Challenges with Data

- Satellite, model, and local radar data work well and easily
- Anything else seems to be more difficult
  - Not able to view upper air data in GEMPAK format
  - Interface to load in surface data in GEMPAK format not efficient – must always load in all times
- Had some challenges with RAMADDA/IDV interaction
  - NOWRAD composite will load from file system, but not RAMADDA
    - Archives of composite radar are limited, may be a service Unidata or a community member could provide
  - Had an SST .nc file where the data plotted differently when loaded from file system vs RAMADDA
  - Could not figure out how to display a Quicktime movie from the filesystem or RAMADDA, ended up loading them in as URLs

Challenges with Data

- One of the reasons RAMADDA is so desirable is that students and faculty can interact with data and have it appear "in the same place"
- The need to serve data via ADDE works against this
  - On top of all of the other work involved in creating these case studies, learning how to use the ADDE environment was too daunting a task
  - The "frustration factor" is a legitimate concern

Challenges with IDV

- Occasional problems with data overlap – wind barbs and color fill? Sometimes I can fix, sometimes not
- Quirky behavior when working with tabs
  - Deleting a tab has no effect
  - Some displays
  - One time I saved a bundle and then opened it and all of the data from different views was collapsed onto one view
  - Suggestion: More descriptive labels rather than View 1, 2, etc. – would make it easier for students to connect plot with display controls
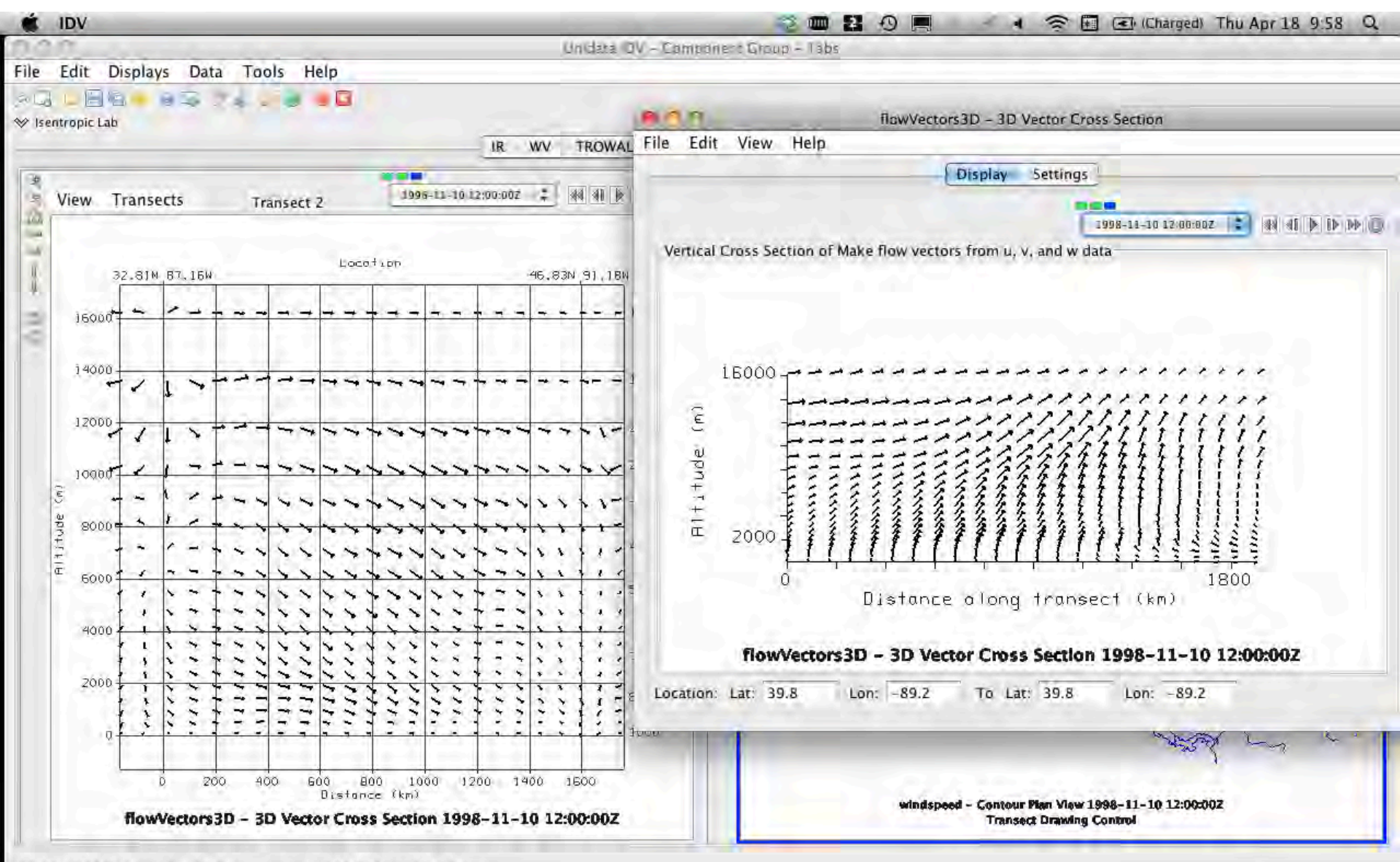
Challenges with IDV

- Cross-sections
  - Needs testing to figure out the bugs
  - No cursor readout as is available in plan view
  - Have had difficulty with transect tool:
    - When moving or drawing a transect, sometimes it connects the endpoints using the long way around the globe
    - Transects are numbered in the tool window, but not in the view – could be color coded instead
    - Could make it easier to enter cross section points
  - Cross-section needs to be labeled with its lat-lon points on each end, or at least "B" and "E"

Challenges with IDV

- Cross-sections
  - Biggest problem is circulations: Different vectors appear on view window vs display control window
    - Not sure if either one is correct
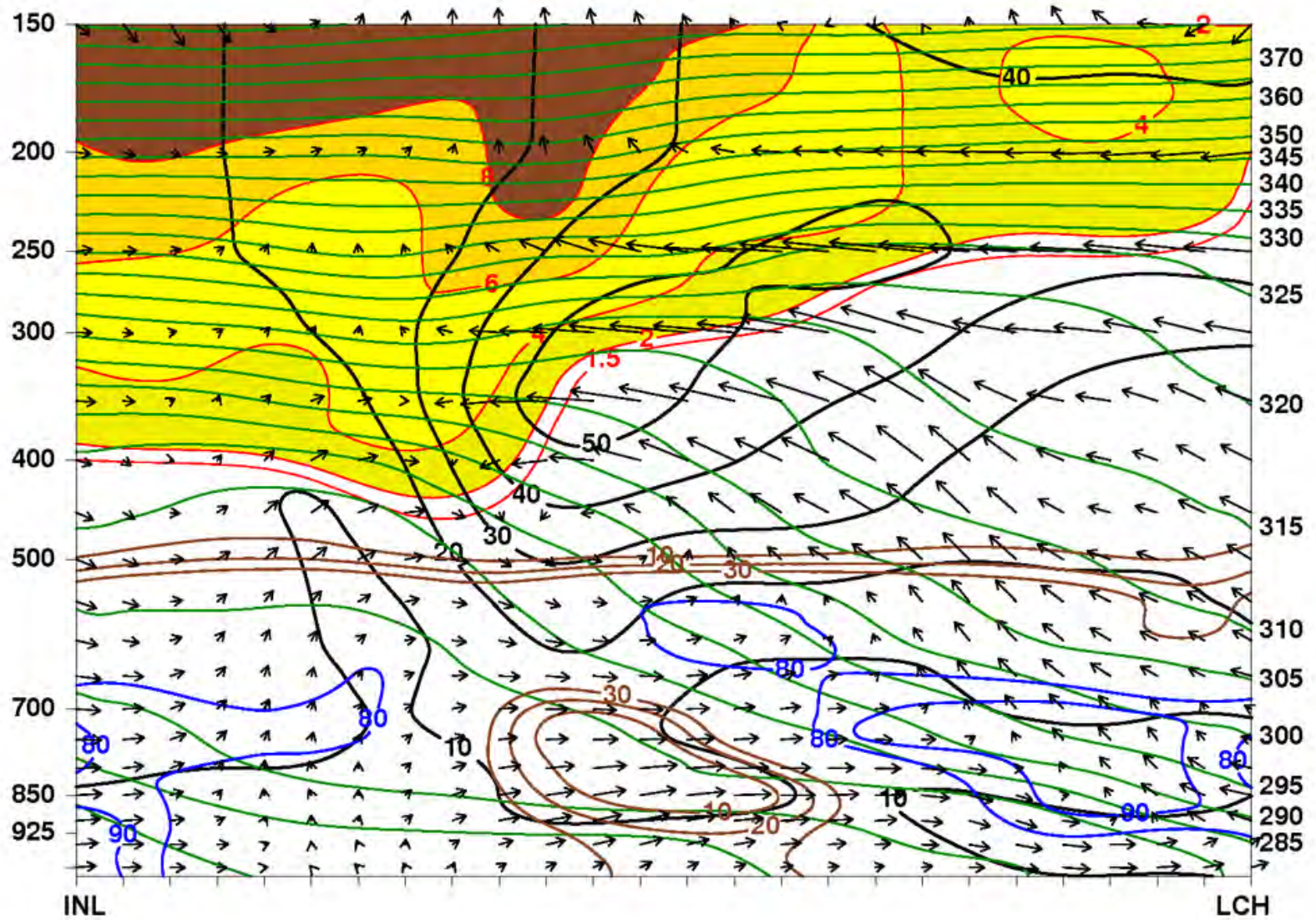   - Negating the vertical motion field did not fix
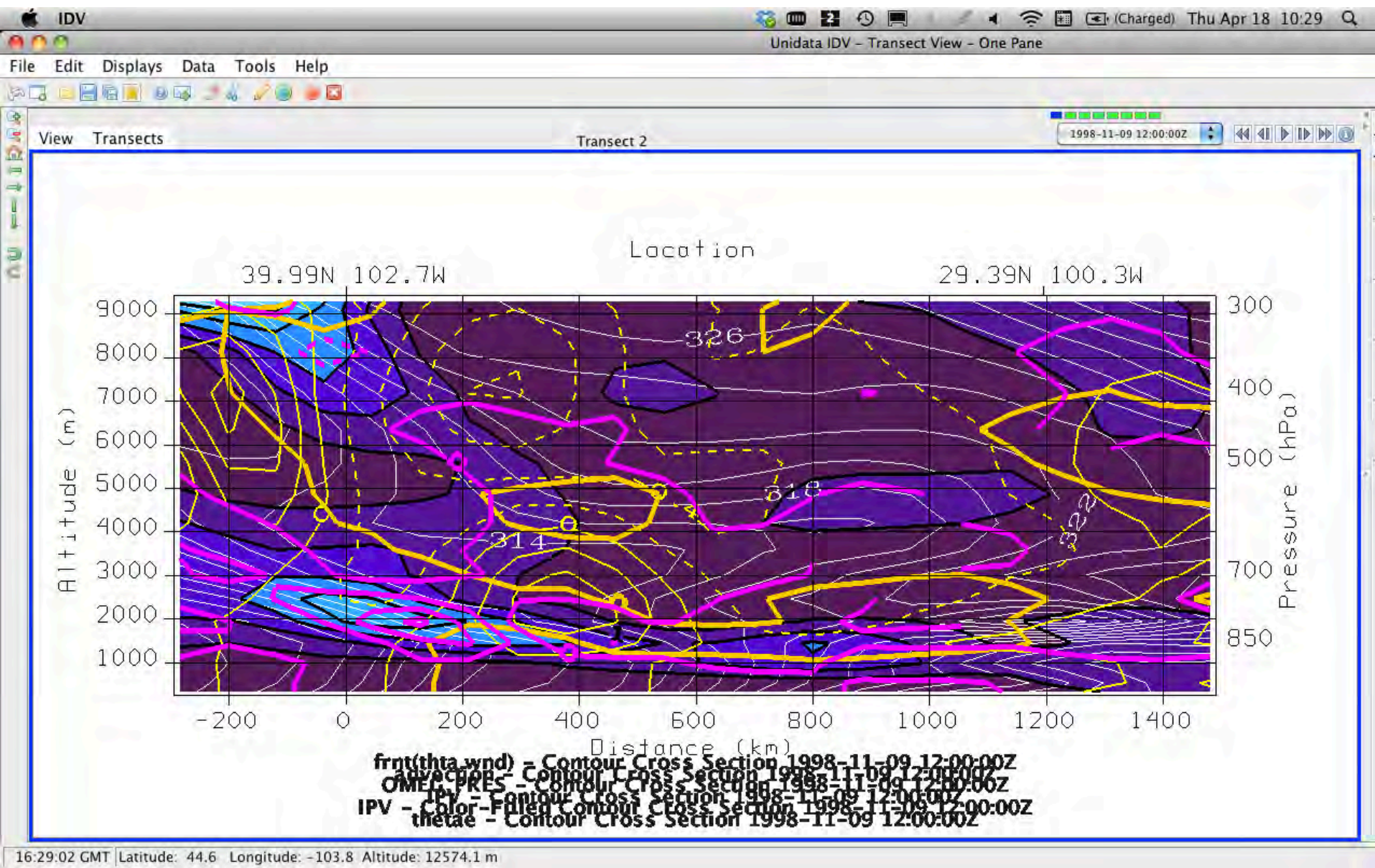
Example of cross-section problem

Challenges with IDV

- Contours, especially in cross sections, don't look "nice"
  - Labels hard to read
  - Lines fuzzy
  - Cannot be fixed by smoothing
- Compare output of IDV vs GEMPAK:

GEMPAK Cross Section

IDV Cross Section

Big Picture

- Difficult to get support requests out when I have to get the labs done on deadlines
  - I will find a work around or will abandon the idea
  - I have a responsibility as a committee member, but "Joe or Jane User" may not be so willing to help
  - Rather than focusing on new features, a review of how the existing features could be improved may be beneficial
- We have nearly 30 lab computers, and our IT will only do updates once a year
  - Use of plugins to fix problems could be a more practical solution – a way to farm the plugin out across machines?

Big Picture

- Pedagogy/Research viewpoint of the IDV
  - What is the community using the IDV to **DO**?
  - Different users interact with the IDV in very different ways depending upon their goals
    - Feature and interface development must take these into account
- As the IDV user base grows larger and more diverse, perhaps an IDV demonstration workshop would benefit the community and the developers
  - The WRF model has tutorial sessions and then the WRF User's Workshop, where people show how they are using the WRF to conduct research and generate operational forecasts