Fifty Years of Unidata and Me

Jim Steenburgh

Professor
Department of Atmospheric Sciences
University of Utah
jim.steenburgh@utah.edu

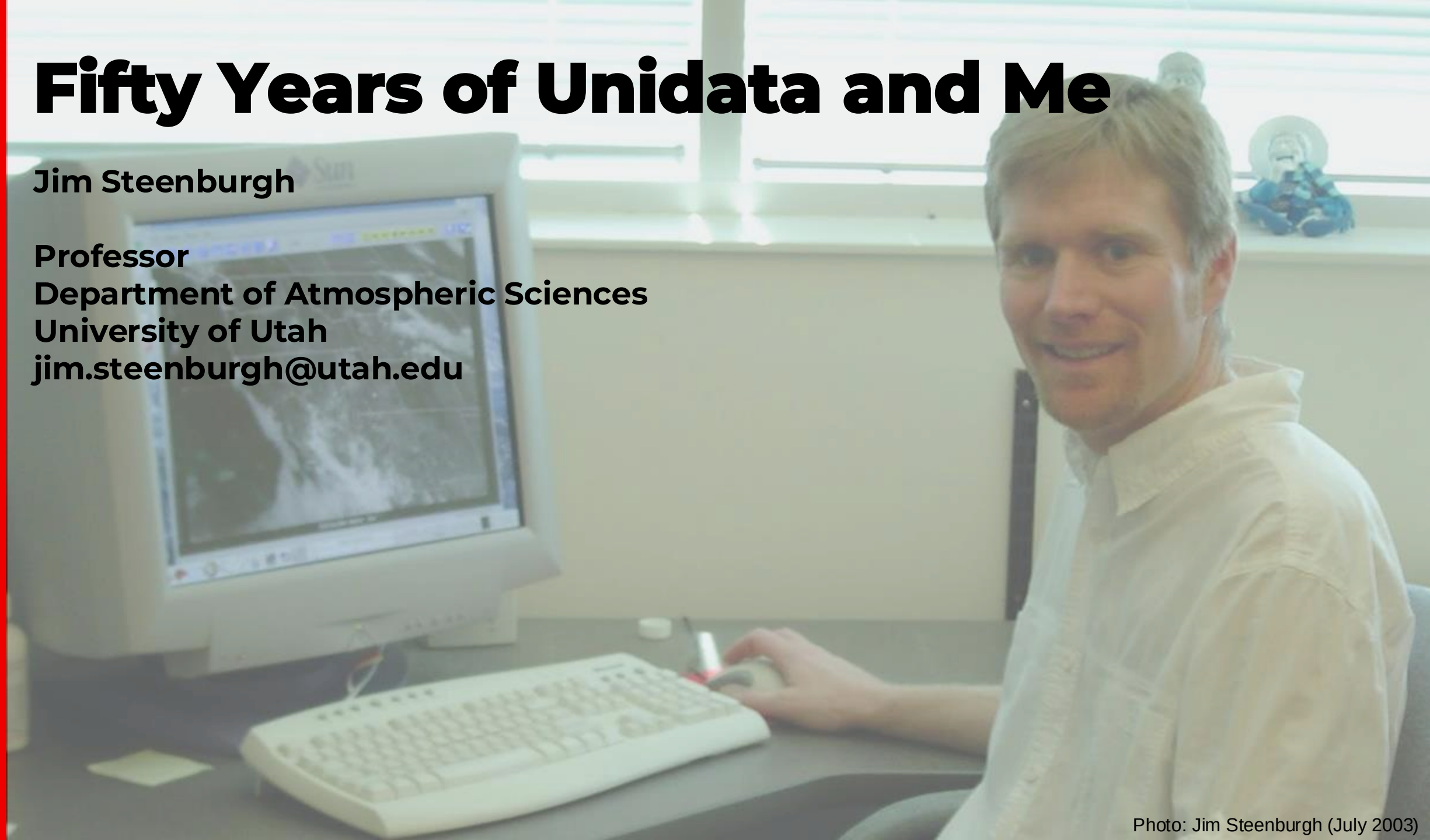
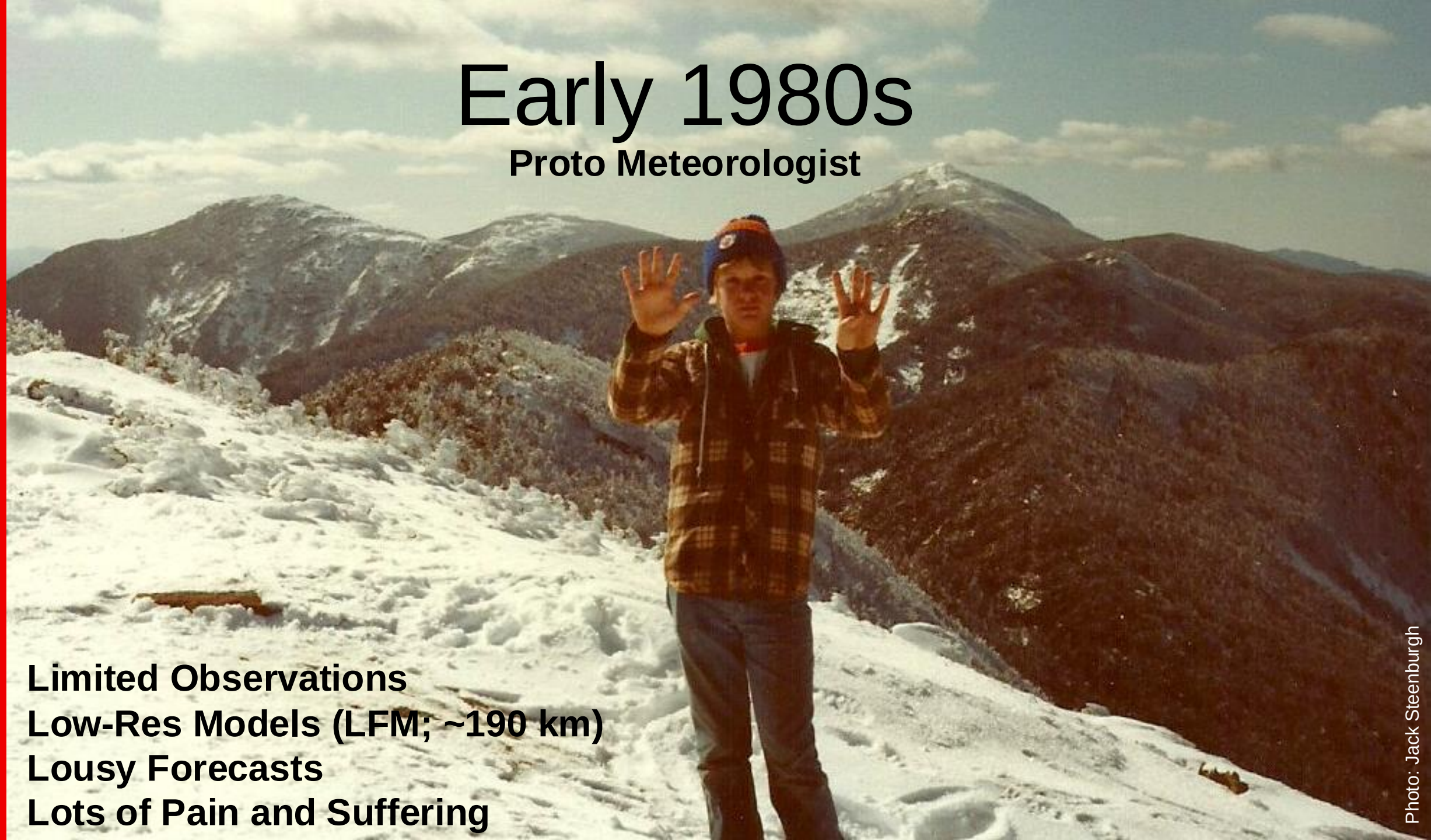


Photo: Jim Steenburgh (July 2003)

Early 1980s

Proto Meteorologist



Limited Observations
Low-Res Models (LFM; ~190 km)
Lousy Forecasts
Lots of Pain and Suffering

Photo: Jack Steenburgh

Early 1980s

Proto Meteorologist

Limited Observations
Lousy Models (LFM; ~190 km)
Lacking Forecasts
Lots of Pain and Suffering

Photo: Jack Steenburgh

Early 1980s (1983)

Proto Unidata

Workshop held at University of Wisconsin with ~80 US meteorology and atmospheric sciences departments sending representatives

Name “Unidata” (university and data) coined

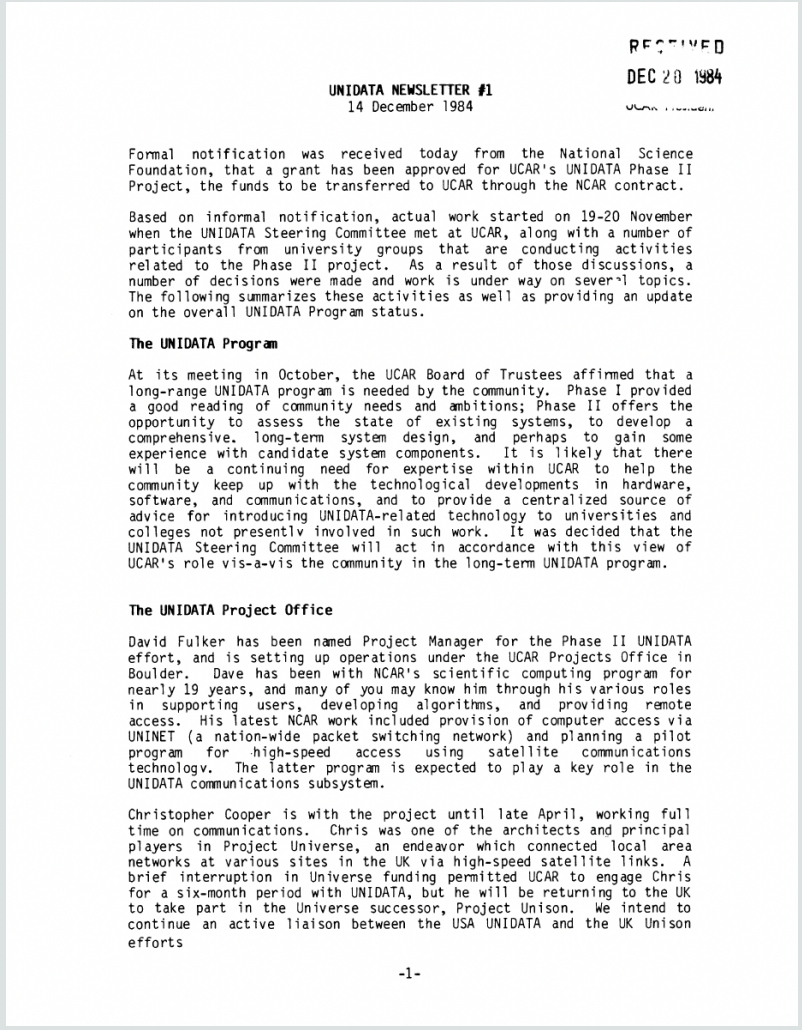
Recommended that UCAR establish and govern Unidata to provide:

1. **Access to current and archived wx data, sat imagery, forecasts**
2. **Support interactive computer capabilities at universities**
3. **Communications capabilities between universities, NCAR, & NASA**

Richard Greenfeld: https://www.unidata.ucar.edu/events/25anniversary/presentations/RECOLLECTIONS%20OF%20THE%20UNIDATA%20ORIGINS-%20Final.pdf

1984

Neo Unidata



RECEIVED
DEC 20 1984

UNIDATA NEWSLETTER #1
14 December 1984

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Based on informal notification, actual work started on 19-20 November when the UNIDATA Steering Committee met at UCAR, along with a number of participants from university groups that are conducting activities related to the Phase II project. As a result of those discussions, a number of decisions were made and work is under way on several topics. The following summarizes these activities as well as providing an update on the overall UNIDATA Program status.

The UNIDATA Program

At its meeting in October, the UCAR Board of Trustees affirmed that a long-range UNIDATA program is needed by the community. Phase I provided a good reading of community needs and ambitions; Phase II offers the opportunity to assess the state of existing systems, to develop a comprehensive, long-term system design, and perhaps to gain some experience with candidate system components. It is likely that there will be a continuing need for expertise within UCAR to help the community keep up with the technological developments in hardware, software, and communications, and to provide a centralized source of advice for introducing UNIDATA-related technology to universities and colleges not presently involved in such work. It was decided that the UNIDATA Steering Committee will act in accordance with this view of UCAR's role vis-a-vis the community in the long-term UNIDATA program.

The UNIDATA Project Office

David Fulker has been named Project Manager for the Phase II UNIDATA effort, and is setting up operations under the UCAR Projects Office in Boulder. Dave has been with NCAR's scientific computing program for nearly 19 years, and many of you may know him through his various roles in supporting users, developing algorithms, and providing remote access. His latest NCAR work included provision of computer access via UNINET (a nation-wide packet switching network) and planning a pilot program for high-speed access using satellite communications technology. The latter program is expected to play a key role in the UNIDATA communications subsystem.

Christopher Cooper is with the project until late April, working full time on communications. Chris was one of the architects and principal players in Project Universe, an endeavor which connected local area networks at various sites in the UK via high-speed satellite links. A brief interruption in Universe funding permitted UCAR to engage Chris for a six-month period with UNIDATA, but he will be returning to the UK to take part in the Universe successor, Project Unison. We intend to continue an active liaison between the USA UNIDATA and the UK Unison efforts

-1-

Unidata Newsletter #1: http://n2t.net/ark:/85065/d73r0r4j

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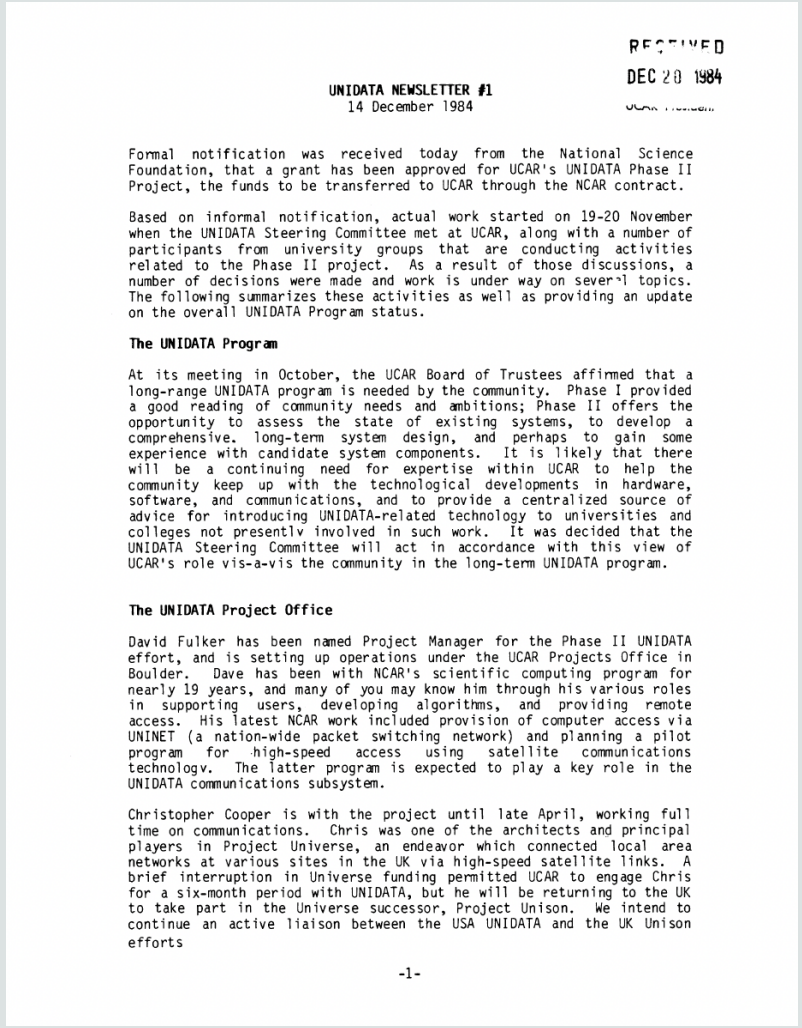
“David Fulker has been named Project Manager”

David Fulker

1984

Neo Unidata



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-1-

Unidata Newsletter #1: http://n2t.net/ark:/85065/d73r0r4j

"To ensure the strongest possible relationship between the Unidata Project office and the academic community, a Management Advisory Committee has been established comprising: "

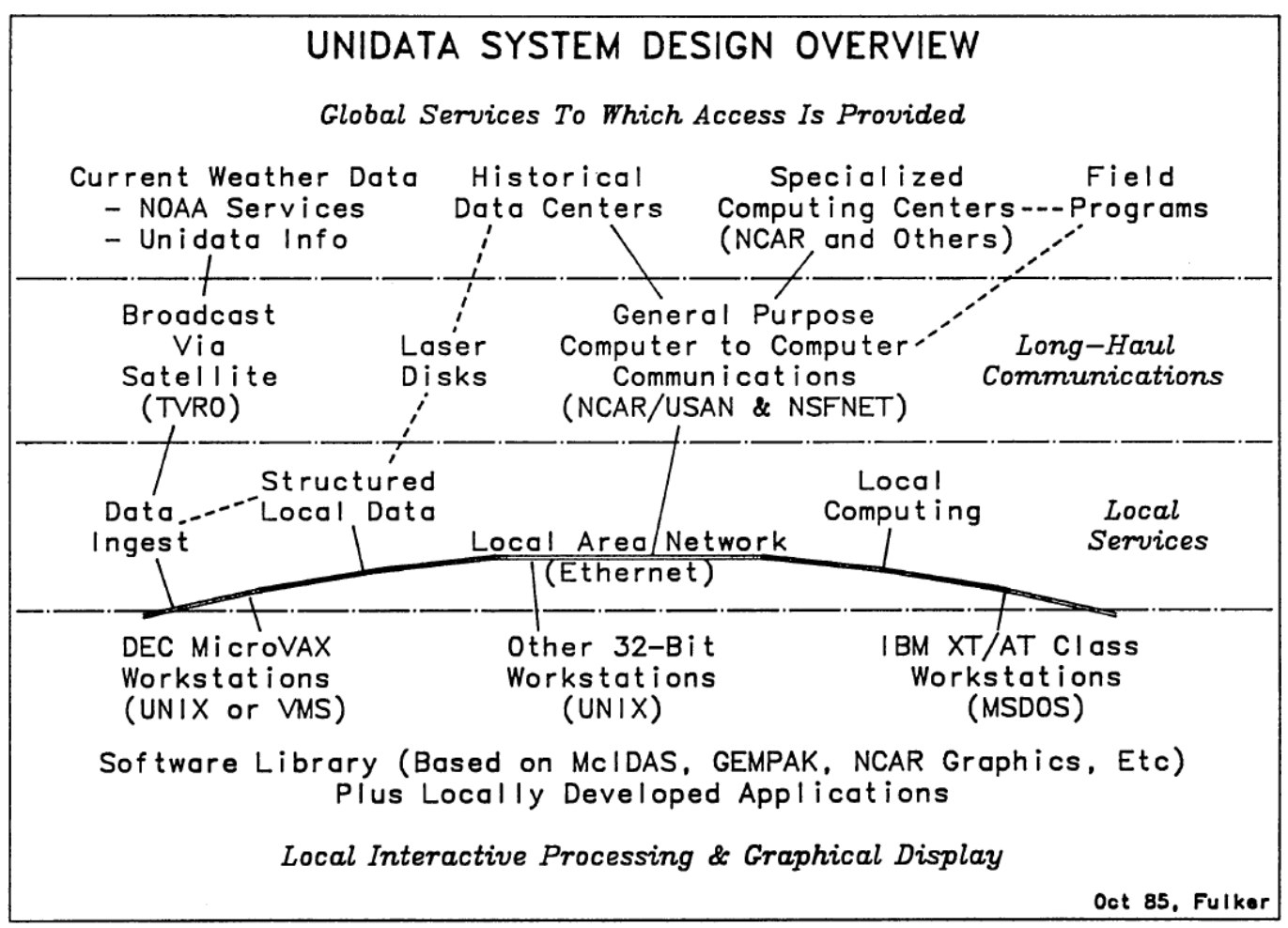
John Dutton (Penn State, PI)
Vernon Suomi (Wisconsin, PI)
Richard Orville (SUNY Albany)
Robert Wilhelmson (Illinois)

And four chairs of the Phase II working groups:

Clifford Mass (Washington, Data Sources)
Earnest Agee (Purdue, Local Hardware/Software)
Christopher Cooper (Rutherford Appleton Lab, Comms)
David Fulker (UCAR, Local Data Management, Temporary)

1985

Neo Unidata



Global data access

Long-Haul Communications

Local Services

Local interactive processing & Graphical Display

Fulker (1986): https://www.researchgate.net/publication/24162648_University_participation_via_UNIDATA_part_2

1987

Neo Unidata

UNIDATA Newsletter

RECEIVED NOV 12 1987 UCAR Library

Volume 2 Number 3 | The Quarterly Newsletter of The UCAR UNIDATA Program | Fall 1987

CONFIGURATIONS

“Six test sites demonstrated the useability of PC-McIDAS”

“Successful testing of our prototype local data manager (LDM)”

“Unidata will be testing and evaluating a working CDF [Common Data Format] system in early December”

“MSDOS, UNIX, or VMS? The Choice is Yours”

http://n2t.net/ark:/85065/d7kp80c8

1989

Neo Meteorologist

Photo: Jack Steenburgh

Classic maproom (Penn State)

Accessing wx obs and satellite imagery on computers (UW)

First e-mail address (UW)

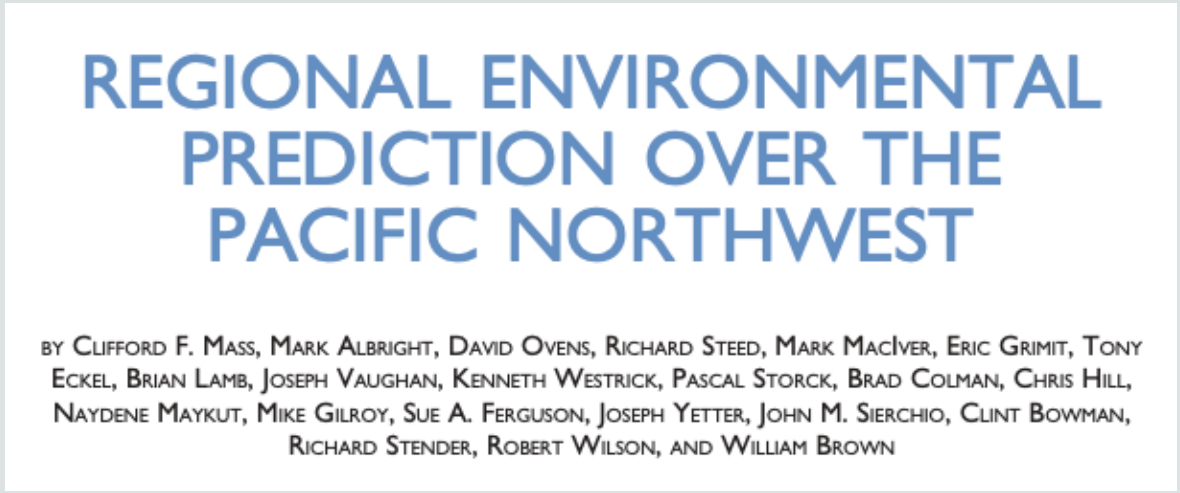
1989

Russell L. DeSouza

First became actively involved in Unidata representing Millersville University
Served on Users and Policy Committees
Represented interests of “small” colleges and universities

1995

Real-Time Mesoscale Modeling



REGIONAL ENVIRONMENTAL PREDICTION OVER THE PACIFIC NORTHWEST

BY CLIFFORD F. MASS, MARK ALBRIGHT, DAVID OVENS, RICHARD STEED, MARK MACIVER, ERIC GRIMIT, TONY ECKEL, BRIAN LAMB, JOSEPH VAUGHAN, KENNETH WESTRICK, PASCAL STORCK, BRAD COLMAN, CHRIS HILL, NAYDENE MAYKUT, MIKE GILROY, SUE A. FERGUSON, JOSEPH YETTER, JOHN M. SIERCHIO, CLINT BOWMAN, RICHARD STENDER, ROBERT WILSON, AND WILLIAM BROWN

"The initial evaluations completed by J. Steenburgh (then a UW postdoc) were so promising that in 1995 real-time prediction using a single 27-km domain of the MM5 was begun"
- Mass et al. (2003)

<u>Critical Unidata Tools</u>
LDM
netCDF

Forecasts posted on the web! (NCSA Mosaic)

1998

Regional Real-Time Numerical Weather Prediction: Current Status and Future Potential

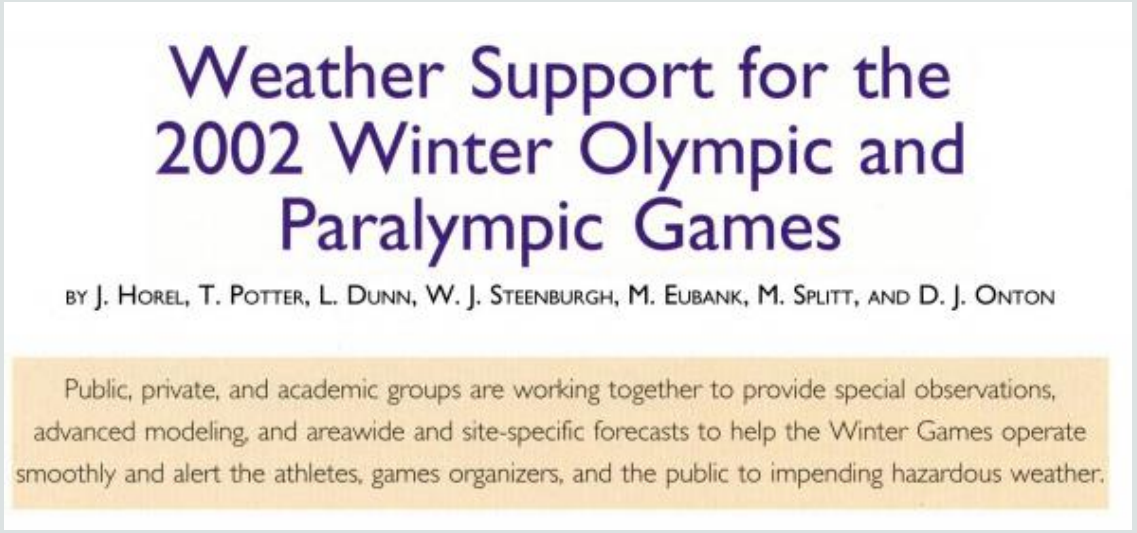
Clifford F. Mass* and Ying-Hwa Kuo+

“Improved university access to NCEP model grids is needed”
- Mass and Kuo (1998)

<u>Unidata Solution</u>
CONDUIT
(the Cooperative Opportunity for NCEP Data Using IDD Technology)

2002

Olympic Winter Games



Weather Support for the 2002 Winter Olympic and Paralympic Games

BY J. HOREL, T. POTTER, L. DUNN, W. J. STEENBURGH, M. EUBANK, M. SPLITT, AND D. J. ONTON

Public, private, and academic groups are working together to provide special observations, advanced modeling, and areawide and site-specific forecasts to help the Winter Games operate smoothly and alert the athletes, games organizers, and the public to impending hazardous weather.

Real-Time MM5 (4-km Grid Spacing)

“Machine Learning” Forecasts

MesoWest (John Horel)

FX-NET
(Cave predecessor with AWIPS visualization over the Internet)

<u>Unidata Tools</u>
LDM
netCDF
Conduit

Photo: Jim Steenburgh

2006
Hawaii
Linda Miller
Community Service Manager
NO OUTLET
XCEL
CRAFT/CONDUIT (C2)
You want Level-II Radar? Including an archive?
You got it
(w/ Kelvin Droegemeier; NWS; UPC; NCDC)

Radar Climatologies of Lake Effect

Great Salt Lake–Effect Precipitation: Observed Frequency, Characteristics, and Associated Environmental Factors

Trevor I. Alcott, W. James Steenburgh, and Neil F. Laird

Print Publication: 01 Aug 2012

Contributions of Lake-Effect Periods to the Cool-Season Hydroclimate of the Great Salt Lake Basin

Kristen N. Yeager, W. James Steenburgh, and Trevor I. Alcott

Print Publication: 01 Feb 2013

Climatological Characteristics and Orographic Enhancement of Lake-Effect Precipitation East of Lake Ontario and over the Tug Hill Plateau

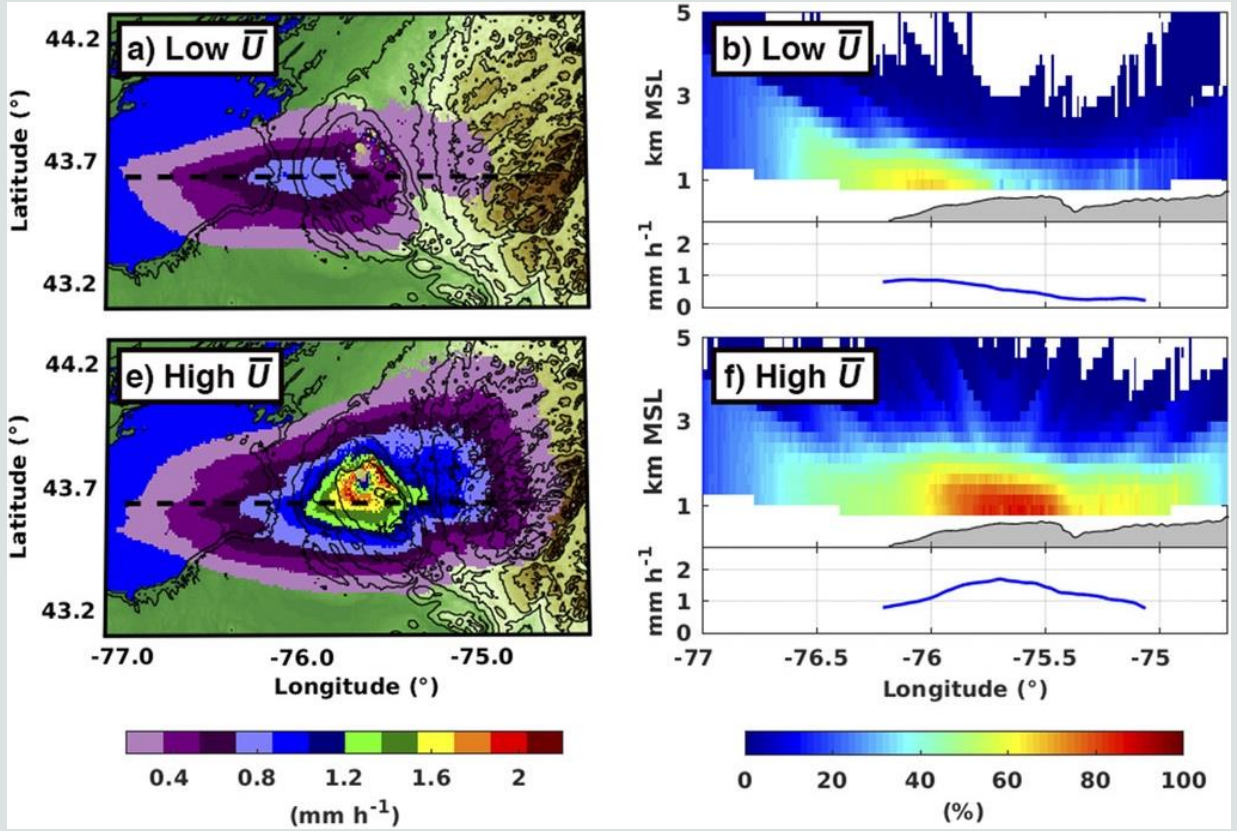
Peter G. Veals and W. James Steenburgh

Print Publication: 01 Sep 2015

Factors Affecting the Inland and Orographic Enhancement of Lake-Effect Precipitation over the Tug Hill Plateau

Peter G. Veals, W. James Steenburgh, and Leah S. Campbell

Print Publication: 01 Jun 2018



Veals et al. (2018)

2006

Neo THREDDS and IDV

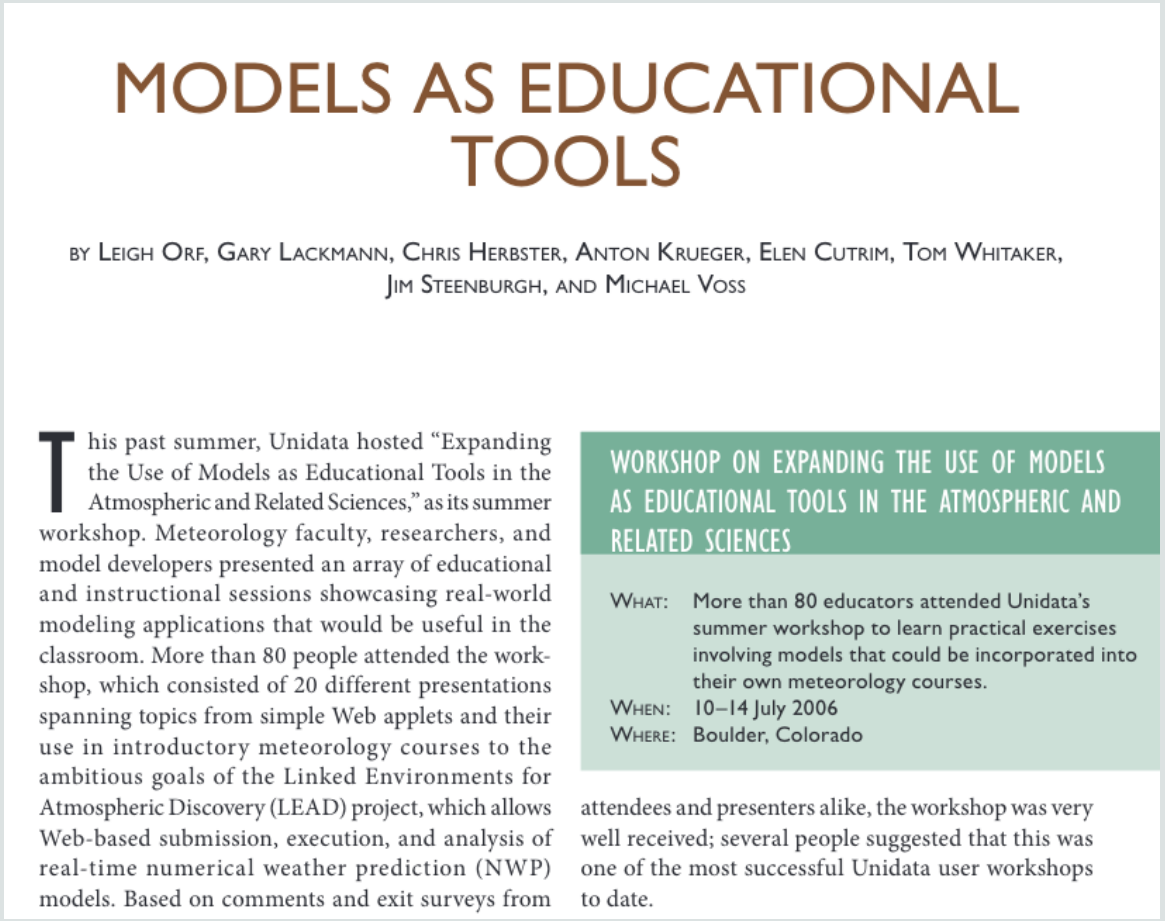
“THREDDS is a key element in support of Unidata 2008 proposal”

IDV 2.0 Released

Photo: Jim Steenburgh

2006

Unidata Summer Workshop (one example of many)



MODELS AS EDUCATIONAL TOOLS

BY LEIGH ORF, GARY LACKMANN, CHRIS HERBSTER, ANTON KRUEGER, ELEN CUTRIM, TOM WHITAKER, JIM STEENBURGH, AND MICHAEL VOSS

This past summer, Unidata hosted "Expanding the Use of Models as Educational Tools in the Atmospheric and Related Sciences," as its summer workshop. Meteorology faculty, researchers, and model developers presented an array of educational and instructional sessions showcasing real-world modeling applications that would be useful in the classroom. More than 80 people attended the workshop, which consisted of 20 different presentations spanning topics from simple Web applets and their use in introductory meteorology courses to the ambitious goals of the Linked Environments for Atmospheric Discovery (LEAD) project, which allows Web-based submission, execution, and analysis of real-time numerical weather prediction (NWP) models. Based on comments and exit surveys from attendees and presenters alike, the workshop was very well received; several people suggested that this was one of the most successful Unidata user workshops to date.

WORKSHOP ON EXPANDING THE USE OF MODELS AS EDUCATIONAL TOOLS IN THE ATMOSPHERIC AND RELATED SCIENCES

WHAT: More than 80 educators attended Unidata's summer workshop to learn practical exercises involving models that could be incorporated into their own meteorology courses.
WHEN: 10–14 July 2006
WHERE: Boulder, Colorado

"We must pool our resources and share our software, methodology, and presentations so that others may be able to include them in their own classes"

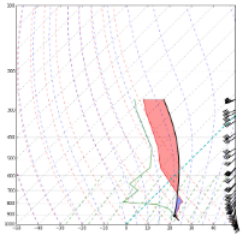
2015

Neo MetPy

“MetPy is an Open Source project aimed at providing a Pythonic library for meteorological data analysis that meshes well with the rest of the scientific Python ecosystem”

MetPy: An Open Source Python Toolkit for Meteorology

28 May 2015



MetPy Skew-T plot (click to enlarge)

MetPy is an Open Source project aimed at providing a Pythonic library for meteorological data analysis that meshes well with the rest of the scientific Python ecosystem. The project heavily leverages the work already done by the Numpy, Scipy, and Matplotlib projects, and adds on top functionality specific to meteorology: plotting (e.g. Skew-Ts), calculations, and reading files (e.g. WSR-88D NIDS files).

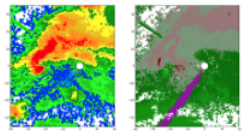
Like 0 Post Email this

The MetPy project began at the University of Oklahoma when then-graduate students Ryan May and Sean Arms (now Unidata Program Center software developers), together with fellow graduate students Patrick Marsh and Eric Bruning, thought it would be a good way to avoid working on their doctoral theses. After years of dormancy due to said theses, work on MetPy has recently resumed.

While MetPy is not an official project of the Unidata Program Center, May and Arms are both heavily involved. Participation by Unidata community members — anything from trying the code and providing feedback to contributing code — is heartily encouraged.

How to Get Involved

The MetPy project is on Github at github.com/metpy/MetPy. Check there for information on grabbing the source and project dependencies. You can also read the documentation online.

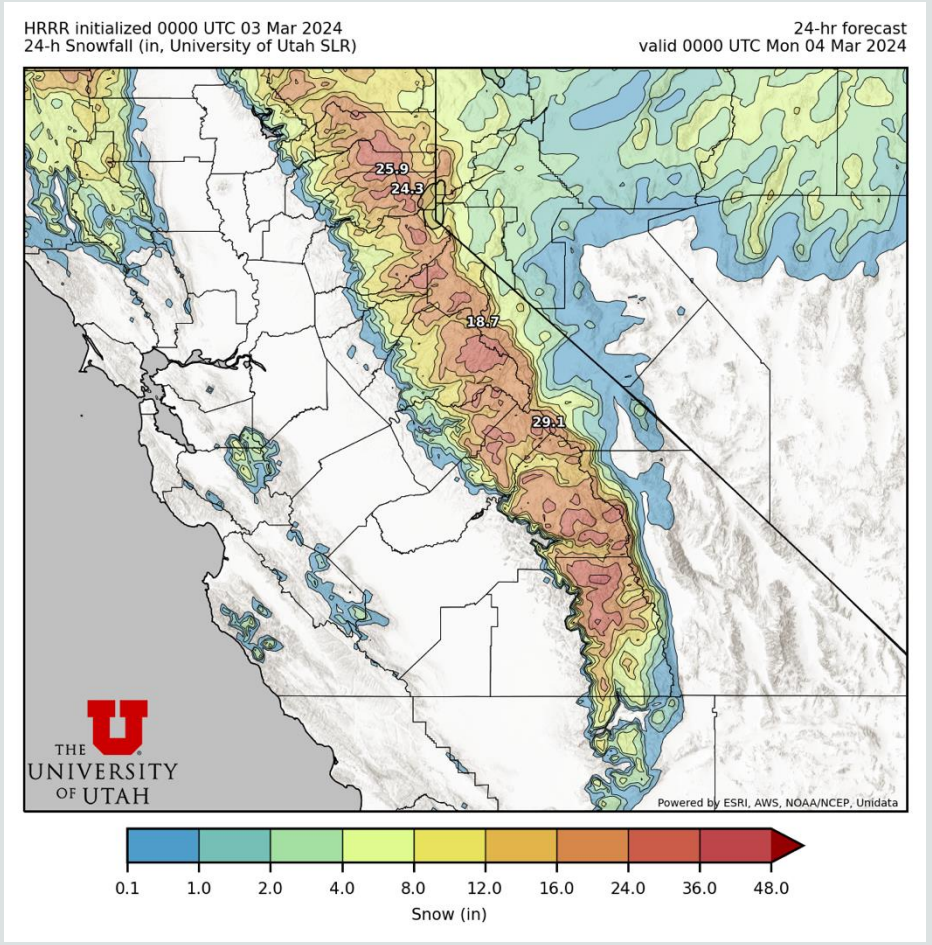


2013 Moore, OK tornado (click to enlarge)

2023

Old Dog, New Tricks

```
#!/usr/bin/env python
# coding: utf-8
# Downloads HRRR, generates SLR, QSF, and WBZ height, and outputs to netCDF file
#
# Will acquire real-time data if nothing is passed to script on command line
# Use YYYY-MM-DD HH:00:00 after script name to acquire specified model run
#
# Requires python 3.9
# Peter Veals, Michael Pletcher, and Jim Steenburgh 19 Apr 2022
# Updated 9 Nov 2023
#
import numpy as np
import pandas as pd
import xarray as xr
import boto3
from botocore import UNSIGNED
from botocore.client import Config
from datetime import datetime, timedelta
import os
import requests
import sys
import glob
import time as pytime
import gc
from scipy.interpolate import griddata
import metpy.calc as mpc
from metpy.units import units as mpu
import netCDF4 as netcdf
import cfgrib
import wrf
from multiprocessing import Pool
```



2023

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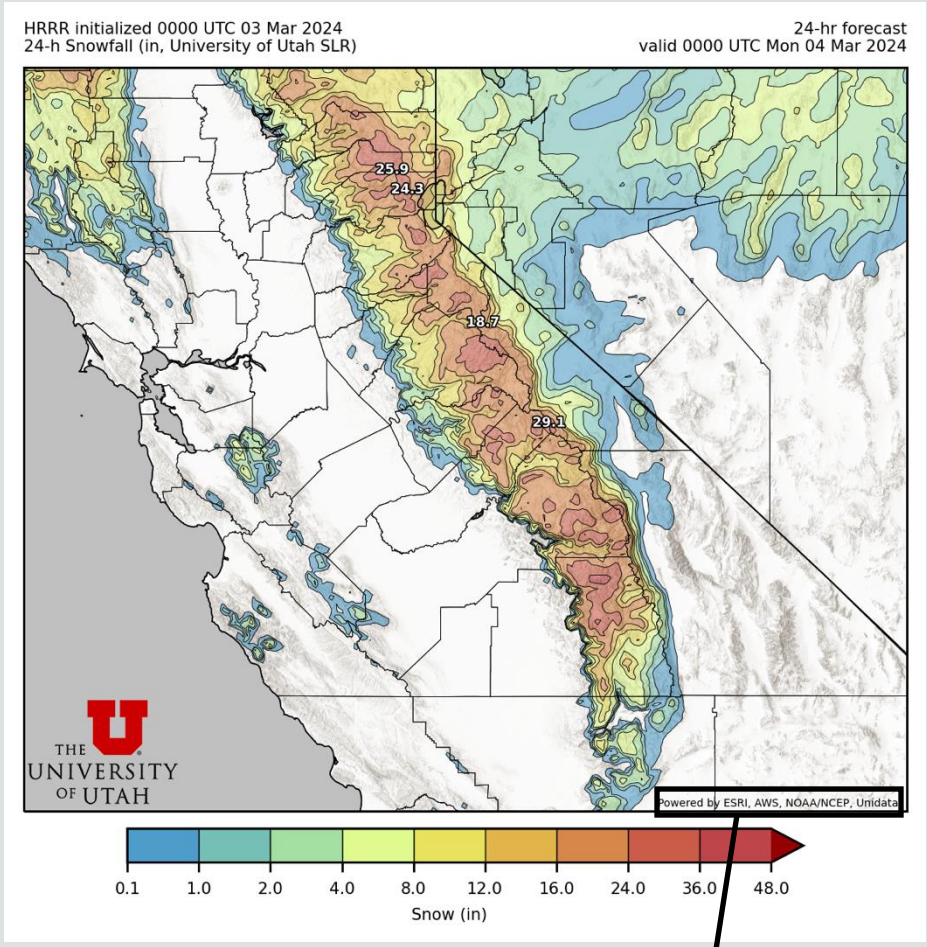

Powered by ESRI, AWS, NOAA/NCEP, Unidata

2034

Fifty Years of Unidata and Me?

- I hope so
- Unidata must transform more in the next 10 years than the previous 40
  - So must higher ed, but there are tremendous opportunities!
  - What must not change is maintaining the "***strongest possible relationship between the Unidata Project Office and the academic community***"
- Let's do this together!