Dezső Dévényi, 1948-2009

- Best data assimilation scientist in RUC / Rapid Refresh (and later, HRRR) group @NOAA Forecast Systems Lab
- Masterful in mathematics and statistics (1988 book - *Mathematical Statistical Methods in Meteorology*)
- Ph.D. from Eőtvős Loránd University in Budapest
- Formerly with Hungarian Met Service (served even as Vice President (Deputy Director))
- Taught NWP in Hungary, called the “father of NWP in Hungary” by former students
- Develop the RUC (Rapid Update Cycle) 3dVAR (3-d variational analysis)
- Co-led development of Rapid Refresh version of GSI with Ming Hu (GSL) and others

Typical Dezső thinking:

"I agree that it works in practice. But how can we be certain that it will work in theory?"

From a professor at l’École Normale Supérieure (in Paris)

NOAA

CIRES

The NOAA RUC/RAP (HRRR) history and Dezső

- 1989 - Reading, UK IUGG – met Stan – 1989
- June 1991 - Stan and Tom Schlatter visit Dezső in Budapest

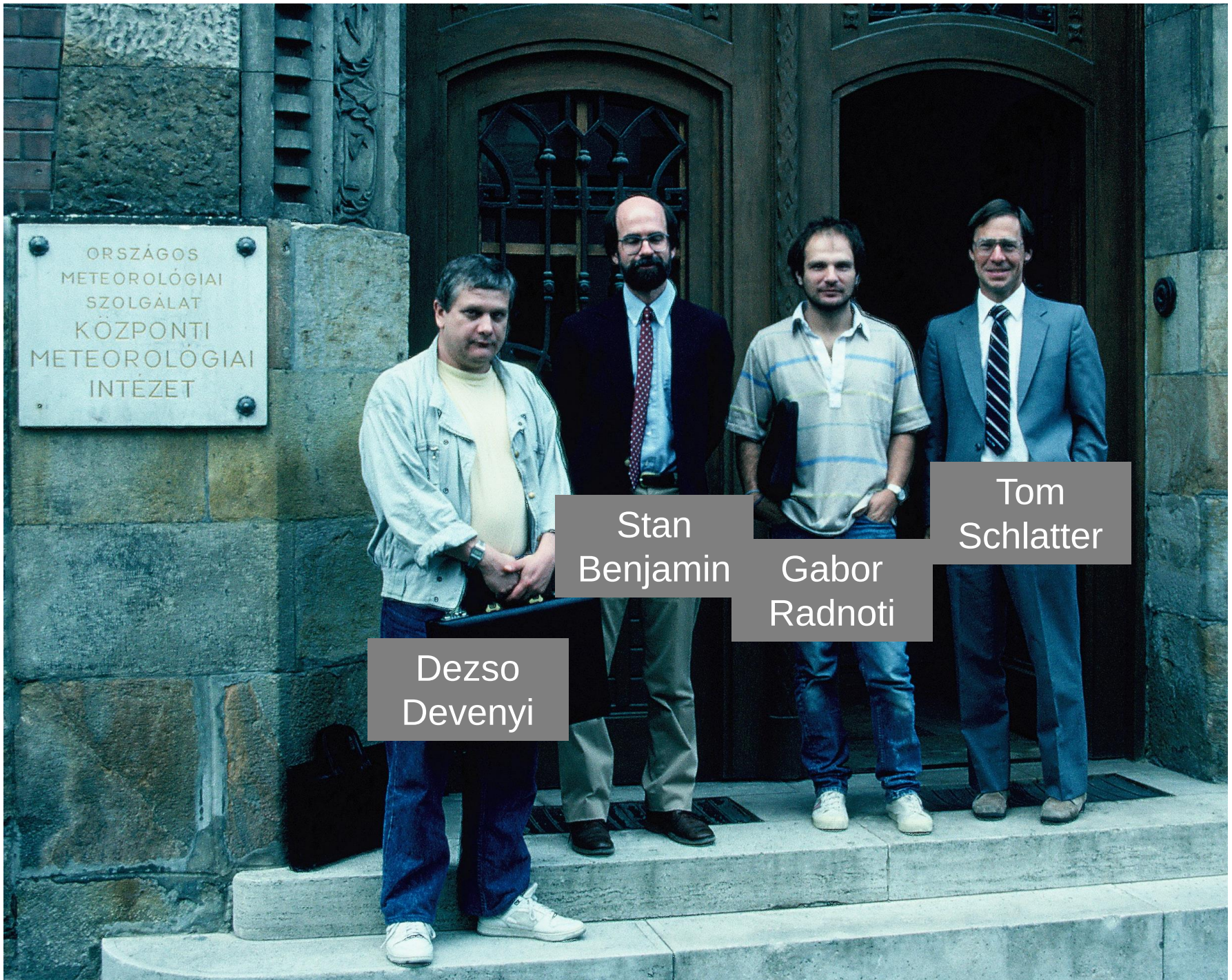
- First RUC Optimal Interpolation analysis in isentropic coordinates
  - Dezső's first visit to Colorado–Oct 1991
- RUC 3dvar – development – 2000-2003
  - Dezső returns to Boulder – 2000
- GSI adaptation for hourly Rapid Refresh – 2006 onward
  - Dezső wrestled first with it

Dezső's tours in Boulder

1991-1993 - NRC
1995-1999-CIRES

2000-2009-CIRES

16 years with NOAA-(now) GSL

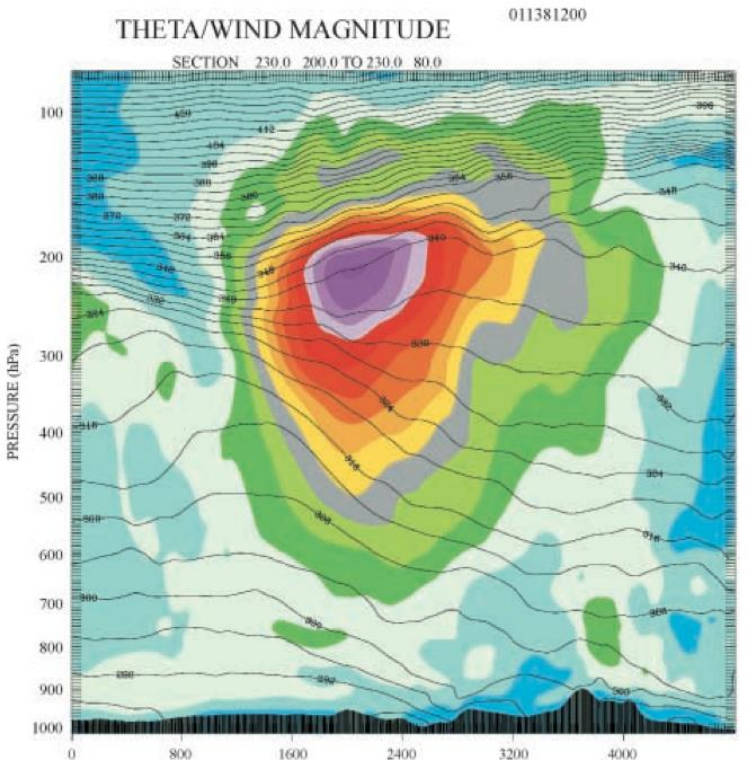


August 1991
Budapest
-
Hungarian Meteorological Service headquarters

August 1991
Budapest

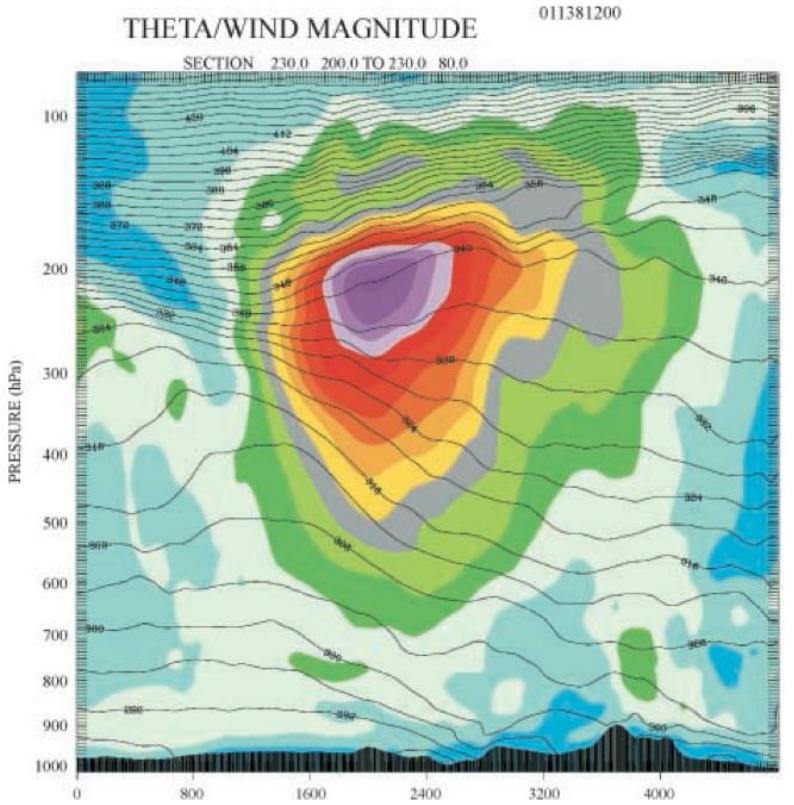
Dezső Devenyi's main accomplishments in US

1. Introduction of variational data assimilation to NOAA high-resolution short-range models
2. Application of the community Gridpoint Statistical Interpolation (GSI) data assimilation to the regional Rapid Refresh (RAP) model.
3. Development of a ensemble-based closure treatment for a deep convective parameterization (Grell and Devenyi 2002)



Dezső Dévényi's main accomplishments in US

1. **Introduction of variational data assimilation to NOAA high-resolution short-range models**



The RUC 3dVAR

- 3d variational analysis in isentropic-sigma hybrid vertical coordinate
- Described by Devenyi and Benjamin – 2003 – MAP – Meteor. Atmos. Physics
  - –Help from Steve Weygandt – NOAA- Boulder
  - –Dave Parrish, Wanshu Wu, Jim Purser–NOAA-NCEP

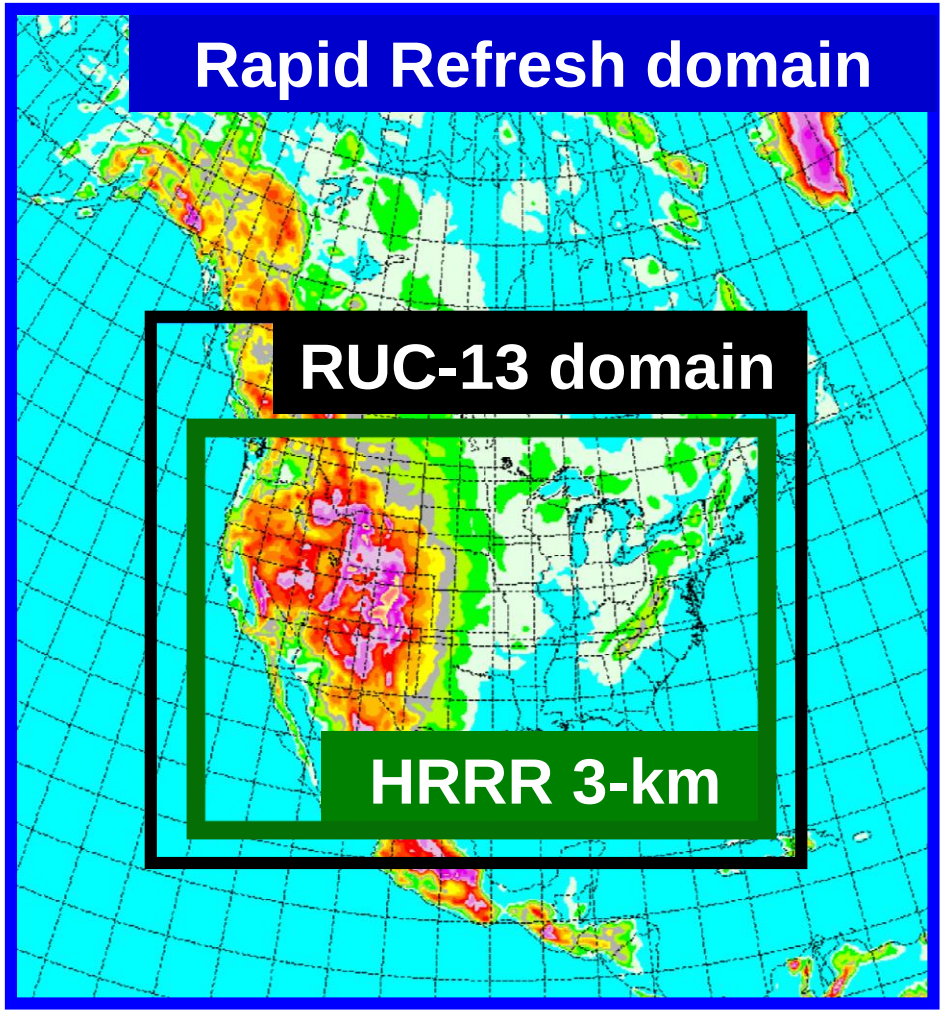
Dezső Dévényi's main accomplishments in US

1. Introduction of variational data assimilation to NOAA high-resolution short-range models

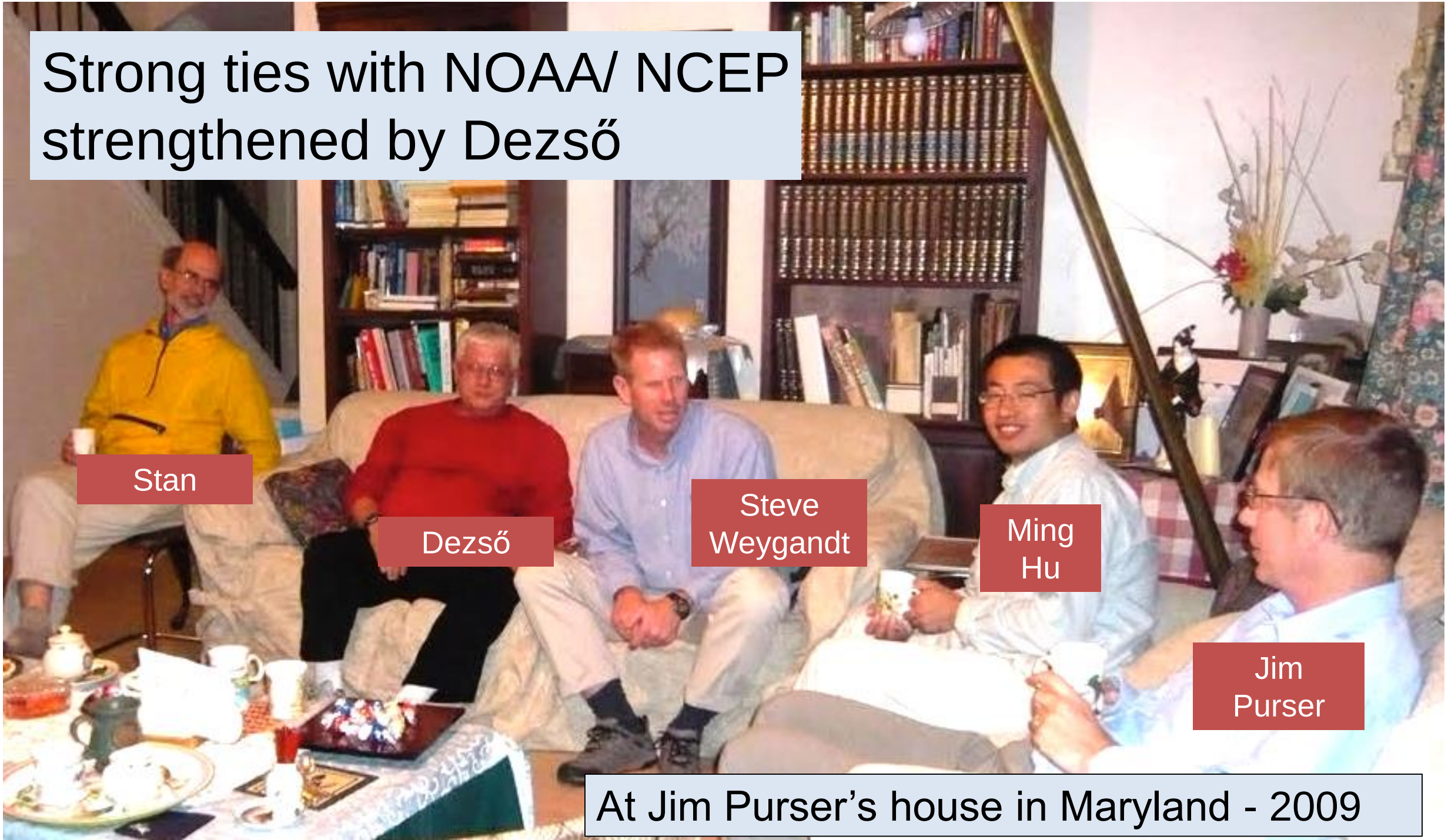
2. **Application of the community Gridpoint Statistical Interpolation (GSI) data assimilation to the Rapid Refresh (RAP) model. (Devenyi and Ming Hu, continued by Ming after 2009).**

Their transfer of GSI from IBM to Linux enabled expansion to community use of GSI - critical.

3. Development of a ensemble-based closure treatment for a deep convective parameterization (Grell and Devenyi 2002)



Strong ties with NOAA/ NCEP strengthened by Dezső



At Jim Purser's house in Maryland - 2009

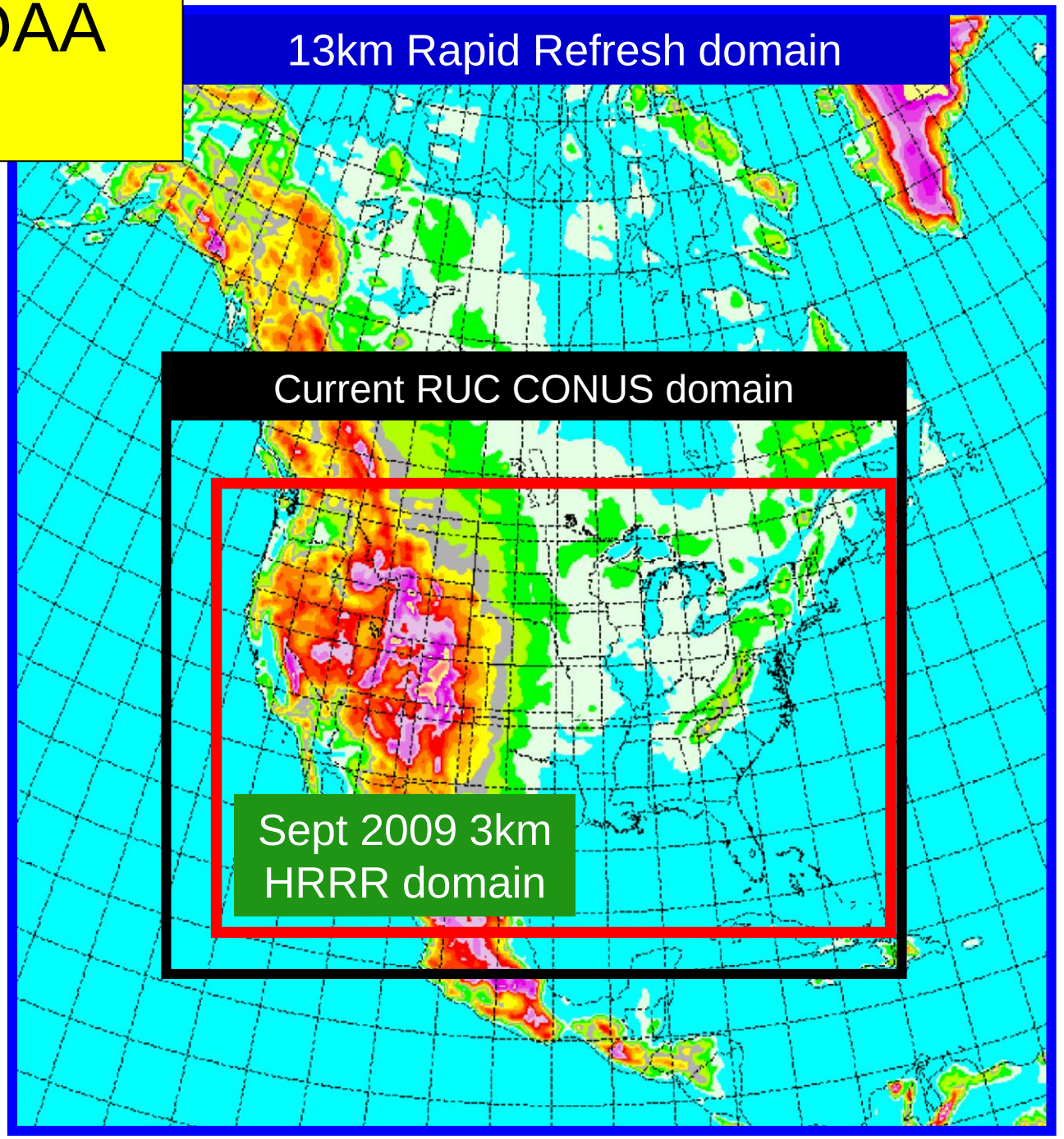
Hourly Updated NOAA NWP Models

RUC – -operational 1994-2012
13km - 18h fcst updated every hour

Rapid Refresh (RAP) –
replaced RUC at NCEP - WRF, GSI w/ RUC-based enhancements. (2012)

HRRR-Hi-Res Rapid Refresh
-3km, radar assimilation, 2014-current

Dezső Dévényi teamed with US scientists to develop data assimilation for RUC, RAP and even the HRRR.



Dezső Dévényi's main accomplishments in US

1. Introduction of variational data assimilation to NOAA high-resolution short-range models
2. Application of the community Gridpoint Statistical Interpolation (GSI) data assimilation to the regional Rapid Refresh (RAP) model.

3. A new ensemble-based deep convective scheme: *"A generalized approach to parameterizing convection combining ensemble and data assimilation techniques"* (Grell and Dévényi 2002). (Basis for Grell and Freitas convective scheme, 2014)

G. A. Grell and S. R. Freitas: A scale and aerosol aware stoc

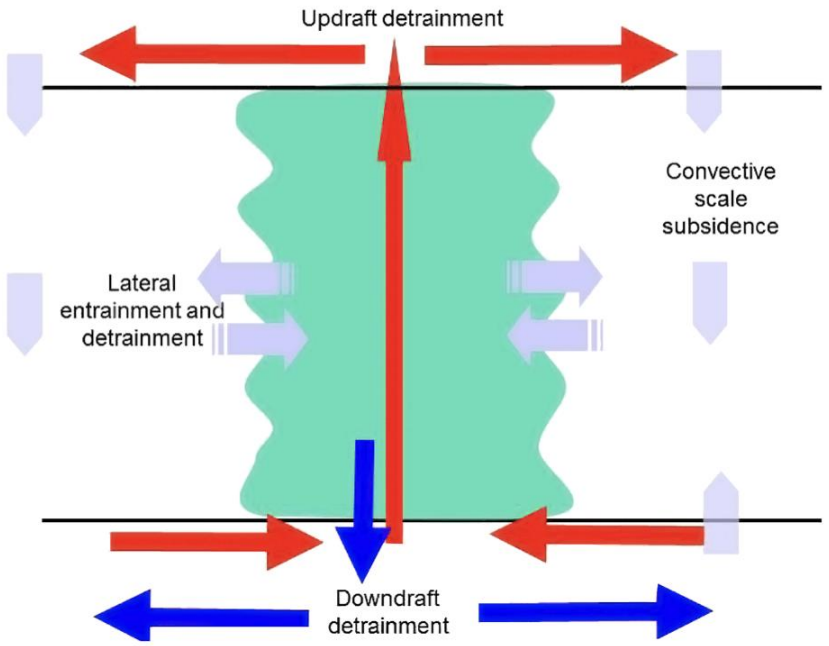
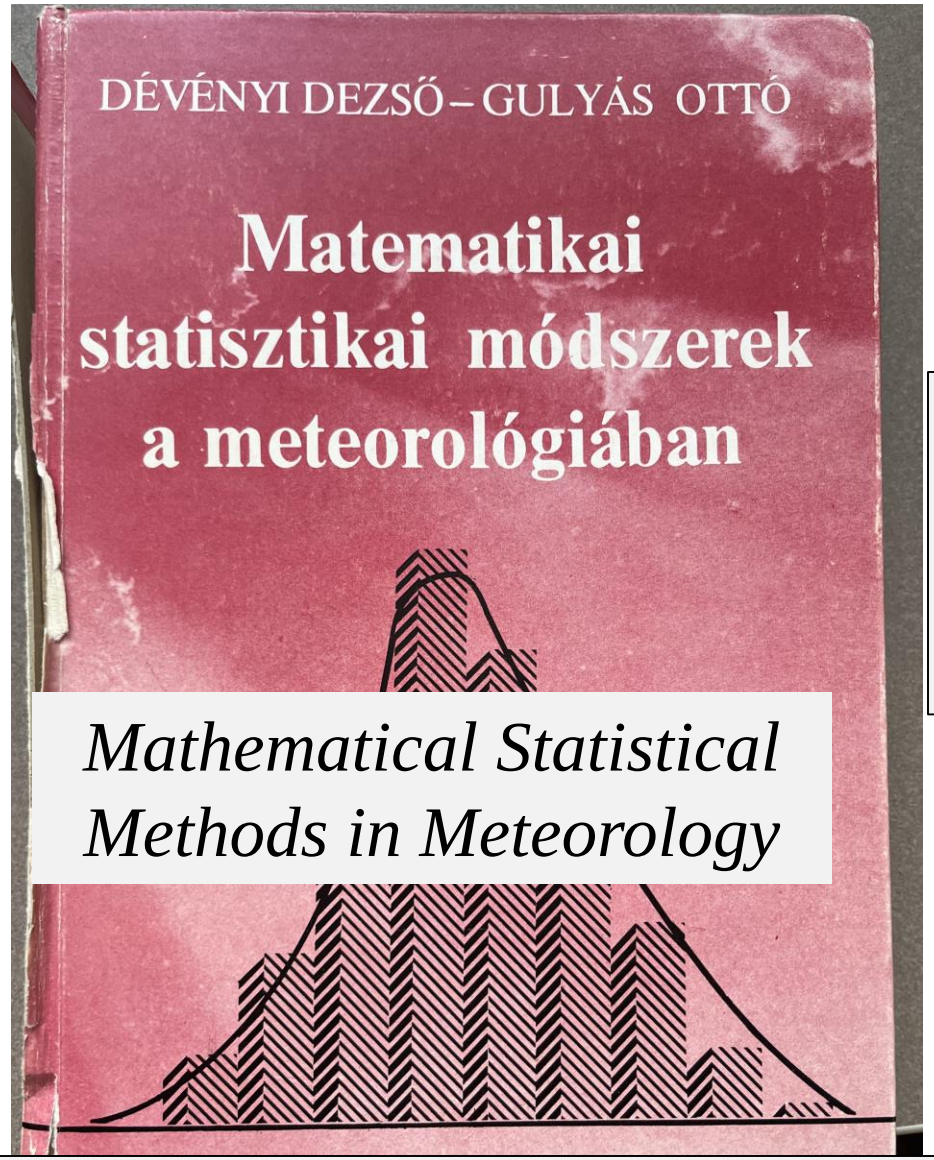


Figure 1. Conceptual picture of a convective cloud.



Mathematical Statistical Methods in Meteorology

Before US/NOAA appointments, Dezső wrote this master book (in Hungarian, 1988).

Lev Gandin →

Gandin →

References in English, Russian and Hungarian

Meteorological objective analysis

bázisának fejlesztése; a spektrális statisztikai és dinamikai modellek alapjai. *Beszámoló jelentés az OMFB részére*, OMSZ, Budapest

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Karlin, S., Taylor, H. M., 1985: Sztochasztikus folyamatok. Gondolat, Budapest

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Kendall, M. G., Stuart, A., 1966: The Advanced Theory of Statistics. Vols. I., II., III., Griffin, London

Kolmogorov, A. N., Fomin, Sz. V., 1981: A függvényelmélet és a funkcionálanalízis elemei. Műszaki Könyvkiadó, Budapest

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Magyarország Éghajlati Atlasza I. és II. (Szerk. Kakas J.), Akadémiai Kiadó, Budapest, 1967

Monte-Carlo methods

Marchuk

Марчук, Г. И., Михайлов, Г. Ф., Назарилиев, М. А., Дарбинян, Р. А., Каргин, Б. А., Елепов, Б. С., 1976: Метод Монте-Карло в атмосферной оптике. Наука, Новосибирск

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Монин, А. С., Яглом, А. М., 1965: Статистическая гидромеханика. Часть 1 и 2. Наука, Москва

Панчев, С., 1967: Случайные функции и турбулентность. Гидрометеоиздат, Ленинград

summer 1999

Boulder, at Stan’s house

RUC/RAP/HRRR History – NCEP (NMC) Model Implementations
(Key roles from Dezső Dévényi)

1994 First operational implementation of RUC (Rapid Update Cycle)
60km resolution, 3-h cycle
1998 RUC @40km resolution, 1-h cycle,
Cloud physics, land-surface model
2002 RUC @20km resolution
GOES cloud data assimilation, 3-d hydrometeor fields
2003 Change to 3dVAR analysis from previous “optimal Interpolation”
2005 RUC @13km resolution
New observation types (METAR cloud, GPS-PW, new cloud physics
2008 Assimilation of radar reflectivity, mesonet winds,
modified Grell/Devenyi cumulus parameterization, other physics
2012 WRF/GSI-based Rapid Refresh replaced RUC at NCEP
2014 WRF/GSI-based 3km HRRR (High-Resolution Rapid Refresh)
implemented at NCEP

Dezső's key journal articles contributing to NOAA Research (FSL, GSD)

- Benjamin, …. Schlatter, Devenyi, - *Időjárás (Hungary)*, 1993
Recent developments in the MAPS/RUC isentropic-sigma data assimilation system

- Devenyi and Schlatter, *Monthly Weather Review*, 1994
Statistical properties of 3h prediction errors from MAPS/RUC

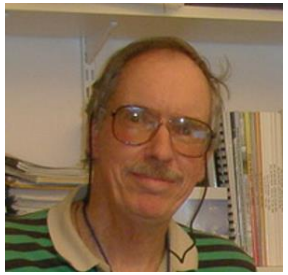
- Grell and Devenyi – *Geophys. Res. Letters*, 2002
Generalized approach to parameterizing convection combining ensemble and data assimilation techniques

- Benjamin, Devenyi, …. *Mon. Wea. Rev*., 2004
An hourly assimilation cycle – the RUC
– NOAA Research Paper of the Year award – 2004

- Benjamin, Weygandt, Hu, Alexander, Smirnova, Olson, etc., 2016, MWR - A North American hourly assimilation and model forecast cycle: **The Rapid Refresh**.

HRRR/RAP Development Team – 30 Sept 2014 (NCEP/HRRR implem day

Data Assimilation Team / Physics

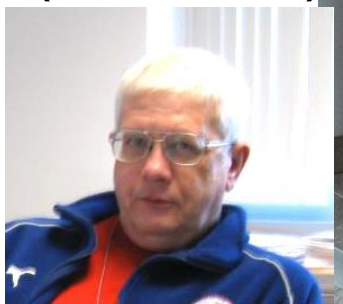


John Brown

David Dowell

Tanya Smirnova

Dezső Dévényi
(1948-2009)



Isidora Jankov

Jaymes Kenyon

Joe Olson

Eric James

Georg Grell

Steve Weygandt

Haidao Lin

Ming Hu

Terra Ladwig

Curtis Alexander

Tracy Lorraine Smith

Stan Benj

Plus many **NCEP** colleagues in EMC and NCO. Also **NCAR**

Greg Thompson
Joe Klemp
Bill Skamarock
James Pinto
Roy Rasmussen

Geoff Manikin
Geoff DiMego
Vijay Tallapragada
Laurie Morone
(for RUC)

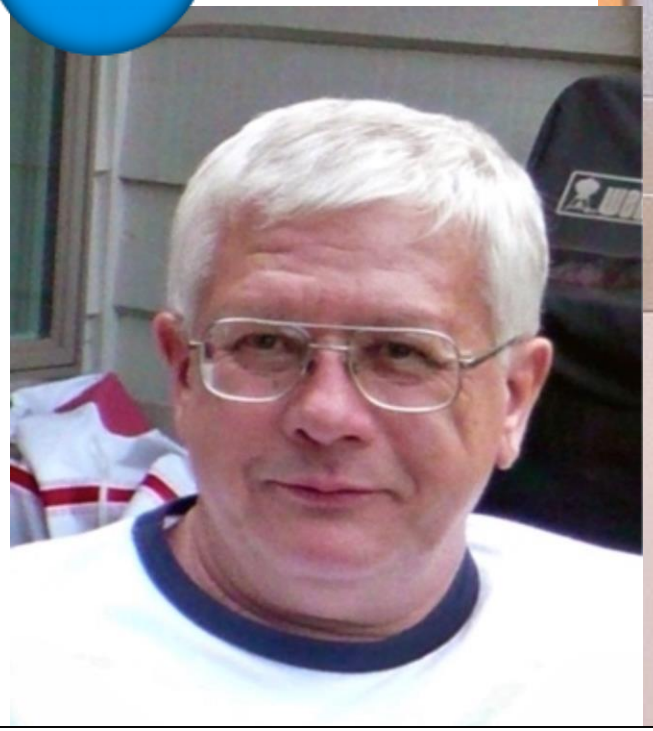
GSI assimilation
Dave Parrish
Wanshu Wu
John Derber
Hui-ya Chuang
Jim Purser

Dezső Dévényi, 1948-2009

- Best data assimilation scientist in RUC / Rapid Refresh (later, HRRR) group
- Masterful in mathematics and statistics (1988 book - *Mathematical Statistical Methods in Meteorology)*
- Ph.D. from Eőtvős Loránd University in Budapest
- Formerly with Hungarian Met Service (even Vice President (Deputy Director))
- Taught NWP in Hungary, called the "father of NWP in Hungary" by former students
- Spent a year with Lev Gandin (then USSR) in 1975. (Lev invented use of statistical methods for data assim.)
- Developed the RUC (Rapid Update Cycle, NCEP 1994-2012) 3dVAR (3-d variational analysis)
- Co-led development of Rapid Refresh version of GSI with Ming Hu (GSL) and others

Dezso biography from Bull. Amer. Meteor. Soc. - 2010
https://jointosse.metforum.org/Dezso/DezsoObit_BAMS.html

Mind meld between Dezső and Stan – Jan 2004



Dezső Dévényi – a master teacher, master colleague, and friend for many of us in NOAA