



# CONCEPTUAL MODELS FOR THE SOUTHERN HEMISPHERE (CM4SH):

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## RESULTS AND WAY FORWARD



Eduard Podgaiskii,  
VLab/CoE Russian Federation,  
representing  
VLab Co-Chair and  
CM4SH Project manager



# CM4SH IS BUILT UP BY:



**PARTICIPANTS FROM AUSTRALIA, SOUTH AFRICA, ARGENTINA, BRAZIL AND INDONESIA:**

**VLAB + UNIVERSITIES + WEATHER SERVICES**







# CM4SH HISTORY

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## Conceptual Models in Satellite Meteorology

- Project from 1995 – 2005
- Collaboration of several EU Met. Institutes with support of Eumetsat
- End Result: **MANUAL OF SYNOPTIC SATELLITE METEOROLOGY**  
(SatManu)
- **50 conceptual models described**
- The Manual is designed to be used by:
  1. University students with a basic knowledge of synoptic meteorology and satellite meteorology
  2. Meteorologists and forecasters
- The manual is maintained and modernized within Eumetrain

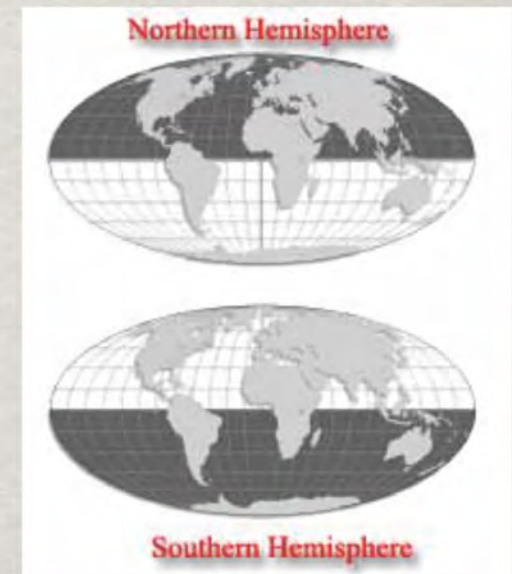




# CM4SH HISTORY

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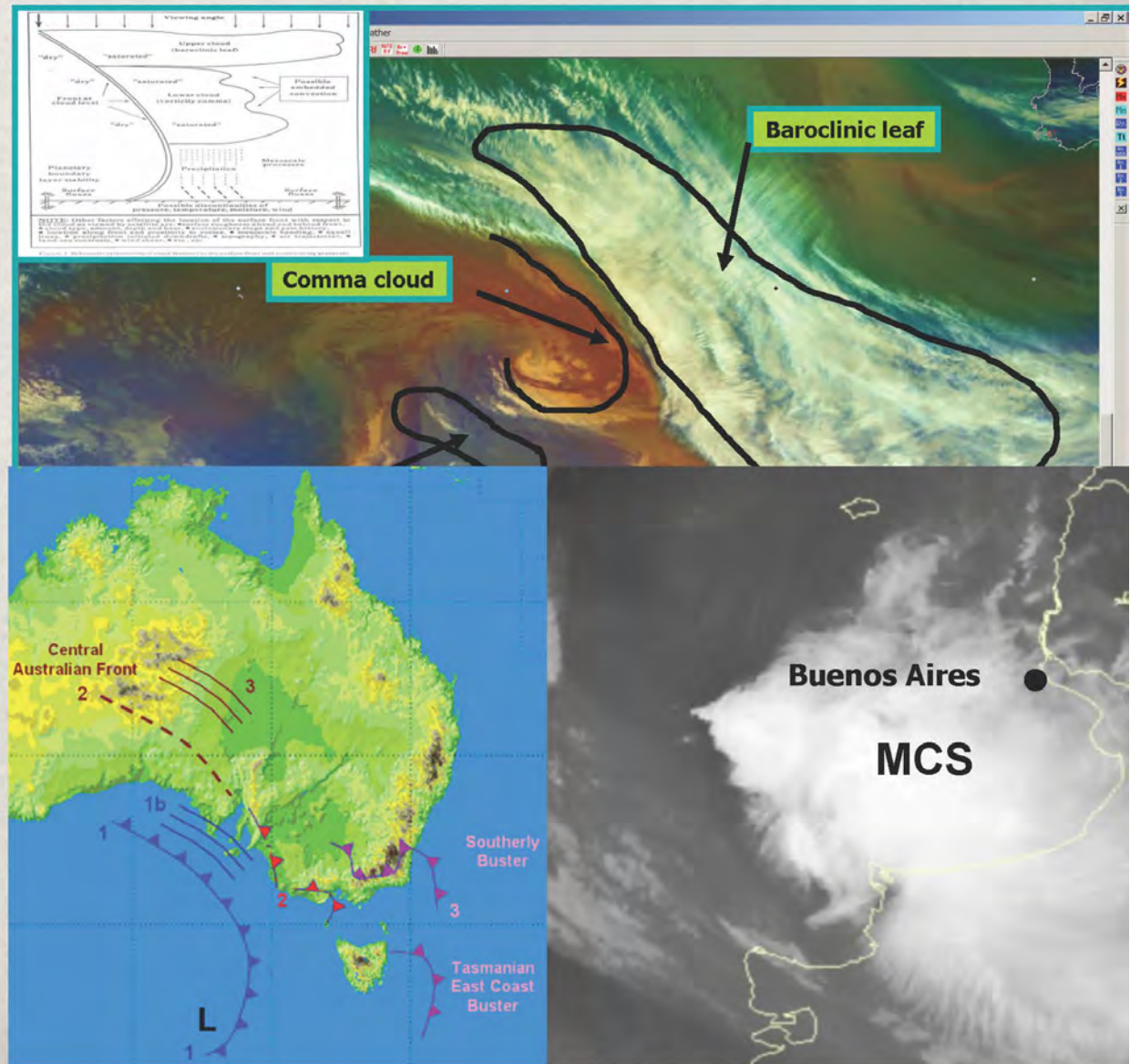
- Satmanu has proved its value as a training- and a forecasting tool throughout Europe and outside.
- The idea of using conceptual models in satellite meteorology was of course not only a European thought, there was an interest all over the world.
- More WMO Vlabs were interested.
- The CM4SH project started in January 2013, ran until March 2014 and then got an extension as CM4SH phase 2 from January 2015 till March 2016.





# THE OBJECTIVES

- To collect, create and share resources about CMs for Southern Hemisphere.
- To increase the operational forecasters' understanding of the weather systems with the help of CMs.



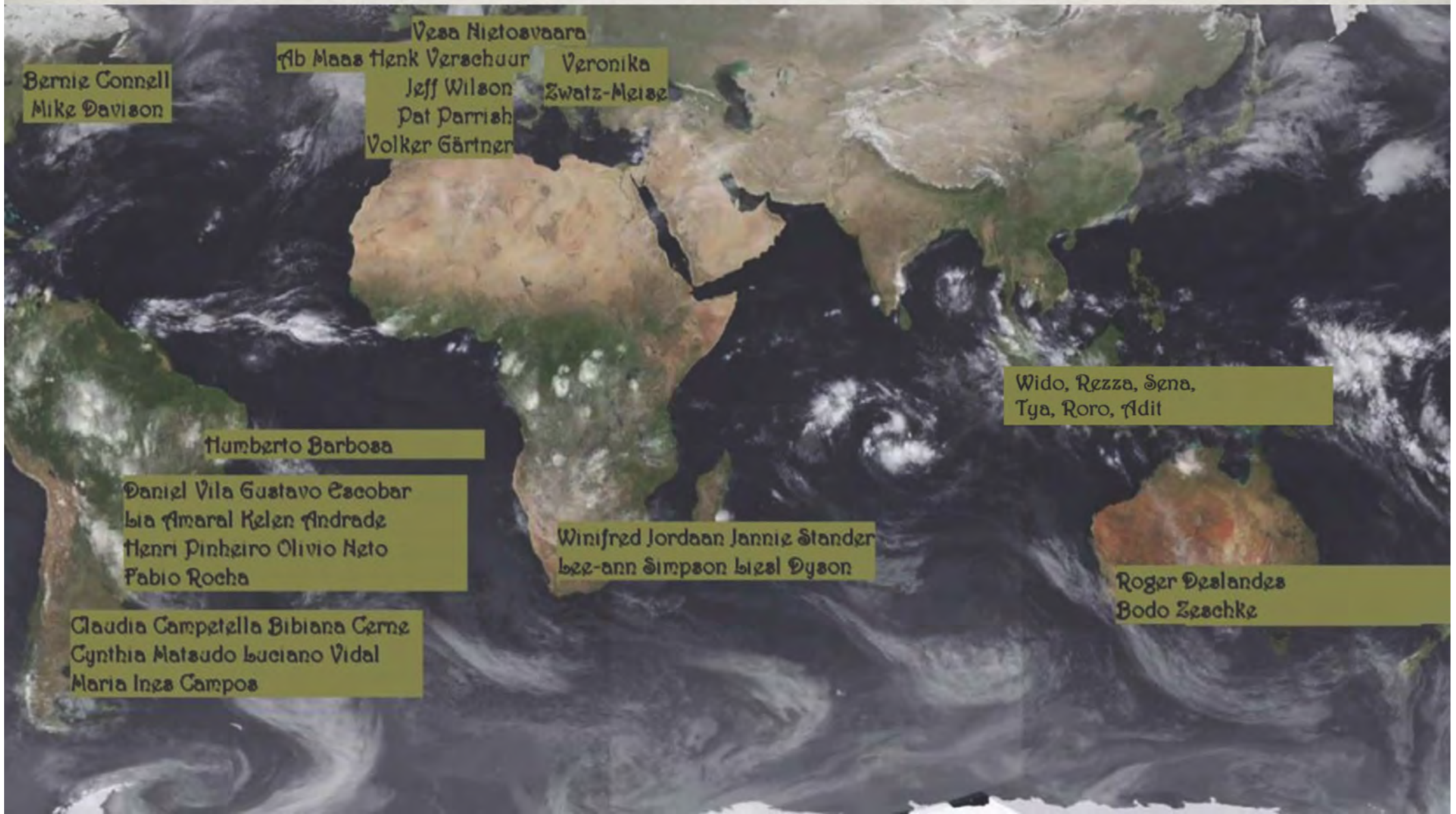




**PROJECT TEAM: COE EXPERTS**

**REVIEW: CIRA + NOAA**

**FUNDING: WMO+EUMETSAT**



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Wido, Rezza, Sena,  
Tya, Roro, Adit

Roger Deslandes  
Bodo Zeschke





# PROJECT DELIVERABLES

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1. A comprehensive list of existing literature
2. A quick-look collection of interesting cases
3. Conceptual Model descriptions

+ much more Orientation sessions ...Inventories of SH Conceptual Models ...  
Training sessions...Sharing regional CMs across all teams

Atlantic Convergence Zone

Mesoscale Convective Complexes

Cyclogenesis and Extra-tropical Cyclones

Upper Tropospheric Cyclonic Vortices in SA

Tropical Cyclones in NA

The South American Low Level Jet (SALLJ)

Zonda winds

Bolivian High and the Relationship with Deep Convection

Cloud patters associated with Cold Fronts in Central Argentina

Northerly Cold Surge

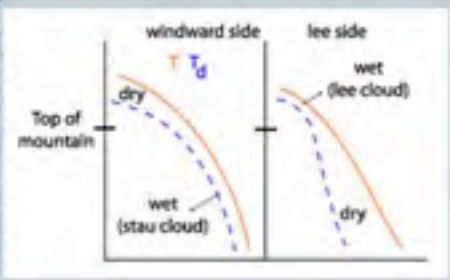
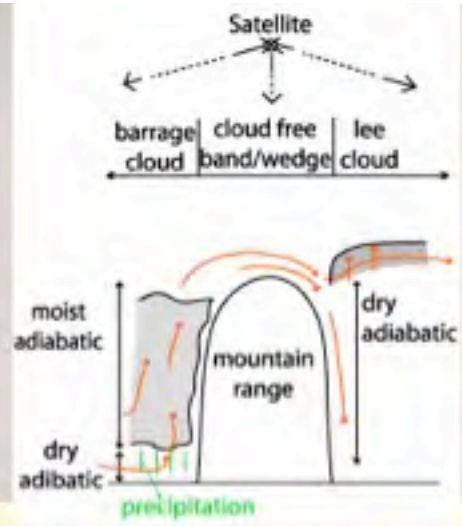
COL

Continental Tropical Lows

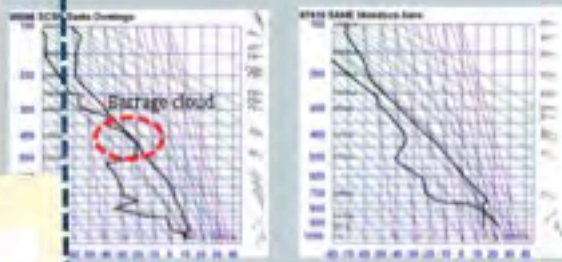
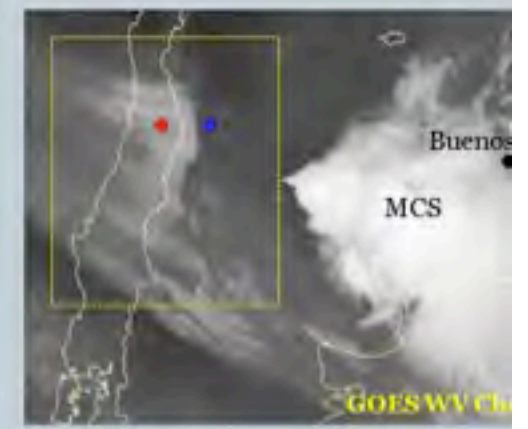
Cold Fronts

Explosive Cyclogenesis  
Shallow Cold Front

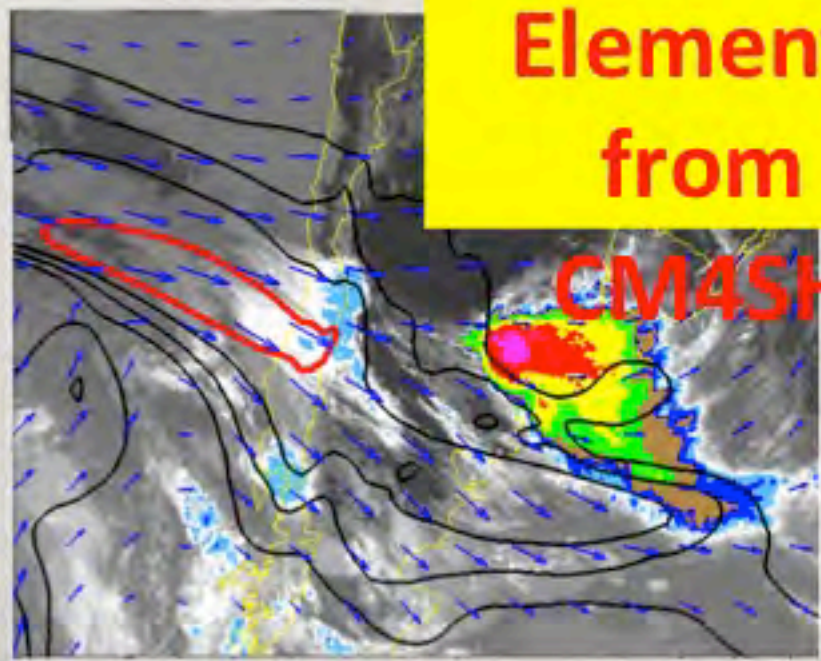




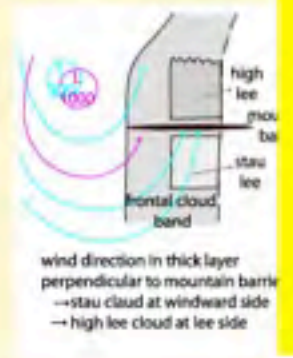
Zonda (Foehn)



Zonda Elements from CM4SH



Key Parameters



Föhn Elements from SatManu





# DEVELOPMENT WORK

## Conceptual Models for Southern Hemisphere

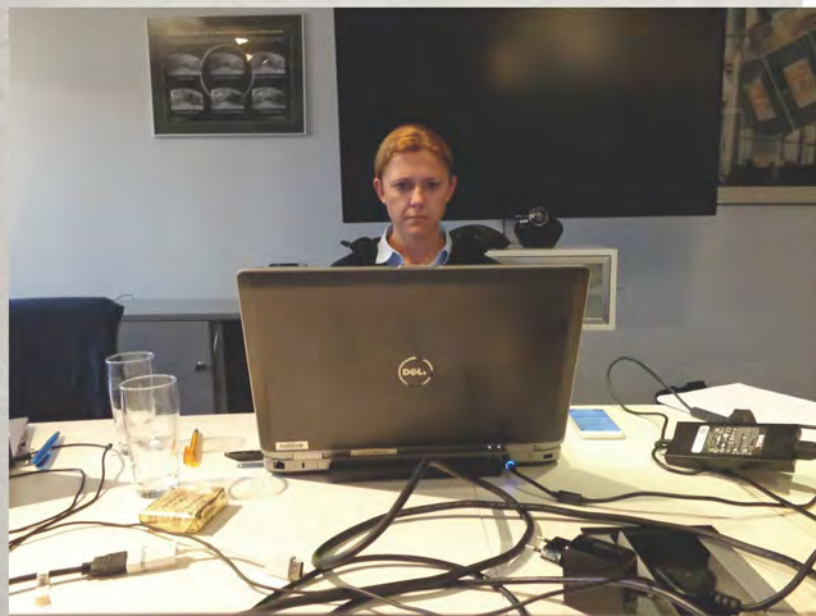
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- SOUTH AFRICA
- COL
- CONTINENTAL TROPICAL LOWS
- VIEW BY CATEGORY
- INVENTORY
- QUICK LOOK CASES
- LITERATURE

### Argentina

This section has been created by the National Meteorological Service of Argentina. The Conceptual Models described here are typical within Argentina and the adjacent countries.

South American Low Level Jet (SALLJ)  
Zonda and Puelche

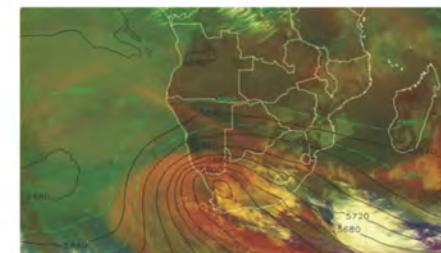


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South Africa >

### Cut-Off Low pressure systems

- |                                     |                                    |                    |   |                |            |
|-------------------------------------|------------------------------------|--------------------|---|----------------|------------|
| CLOUD STRUCTURE IN SATELLITE IMAGES | METEOROLOGICAL PHYSICAL BACKGROUND | NWP KEY PARAMETERS | TYPICAL APPEARANCE IN VERTICAL CROSS SECTIONS | WEATHER EVENTS | REFERENCES |
|-------------------------------------|------------------------------------|--------------------|---|----------------|------------|



Airmass RGB overlaid with 500hPa heights (gpm) valid for 13 July 2012 at 1200UTC

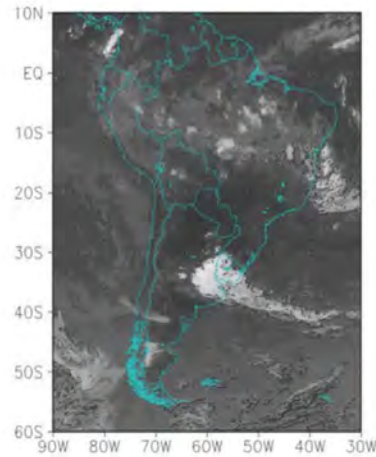
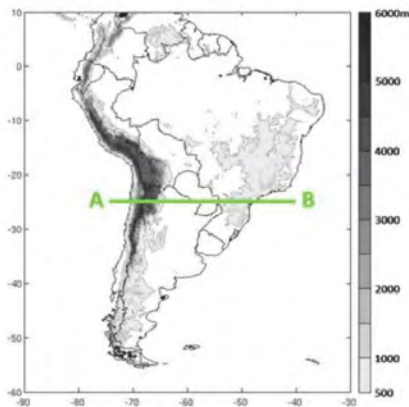
Cut-Off Low (COL) pressure systems are one of the main precipitation and hazardous weather producing weather systems that affect South Africa. This conceptual model aims to present the various stages of development of a COL over southern Africa and the cloud features and weather associated with it.



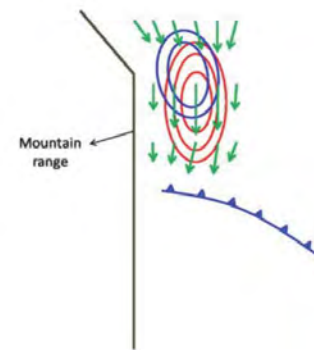


# SOUTH AMERICAN LOW LEVEL JET

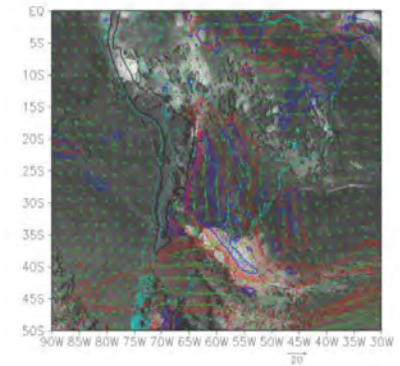
Zonal vertical cross section



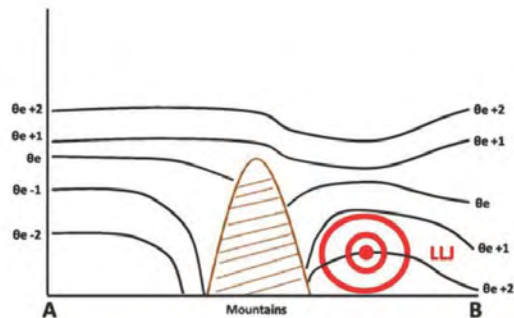
Bonner Criterion 1: Wind shear 850–700 hPa, isotachs and wind vectors at 850 hPa.



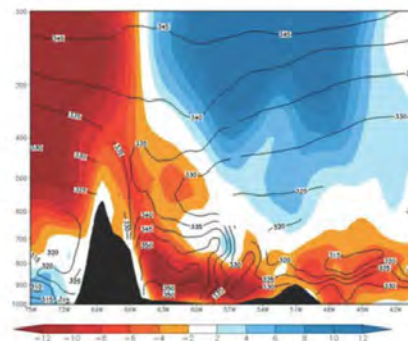
28 February 2002 06:00 UTC - GOES 13 IR 10.8 image; blue: wind shear 850-700 hPa, red: isotach at 850 hPa, green vector: wind at 850 hPa.



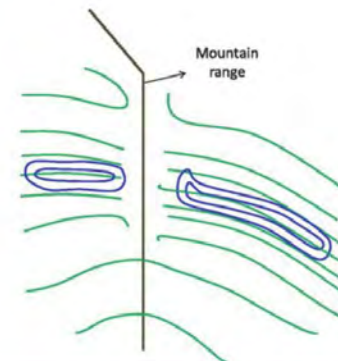
Meridional Wind and Theta-e



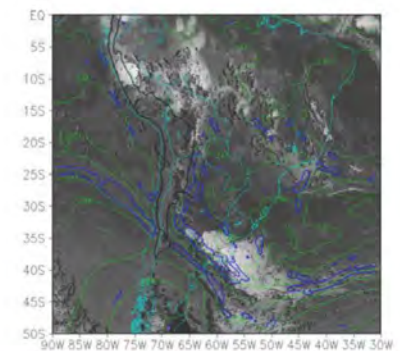
Lat: 27°S. Meridional wind velocity (shaded, m/s); black: isentropes (theta-e, K) - 28 Dec 2002 12 UTC



Equivalent Thickness 850–500 hPa and TFP

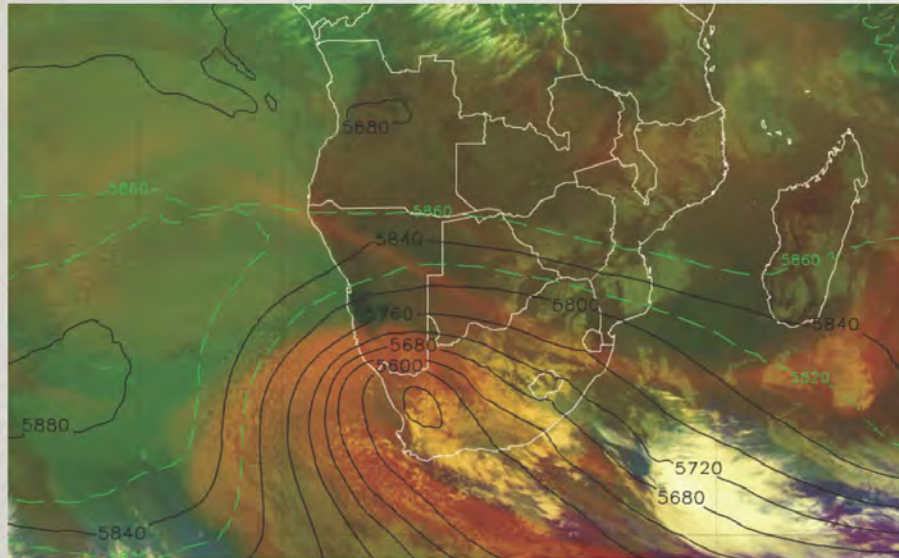


28 February 2002 06:00 UTC - GOES 13 IR 10.8 image; green: equivalent thickness, blue: TFP.

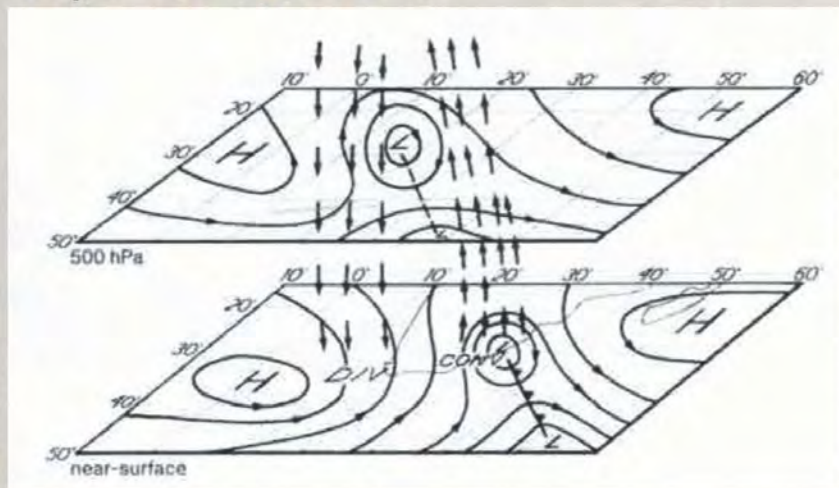




# CUT-OFF LOWS



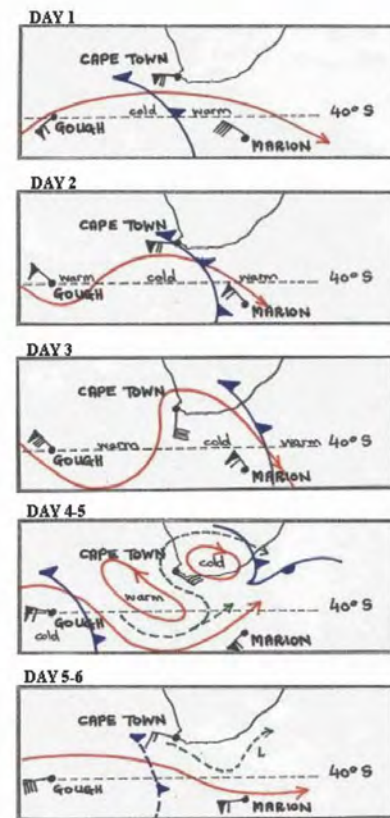
Airmass RGB overlaid with 500hPa heights (gpm) valid for 13 July 2012 at 1200UTC



Areas of convergence, divergence and uplift associated with COL systems, at the surface and 500hPa



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

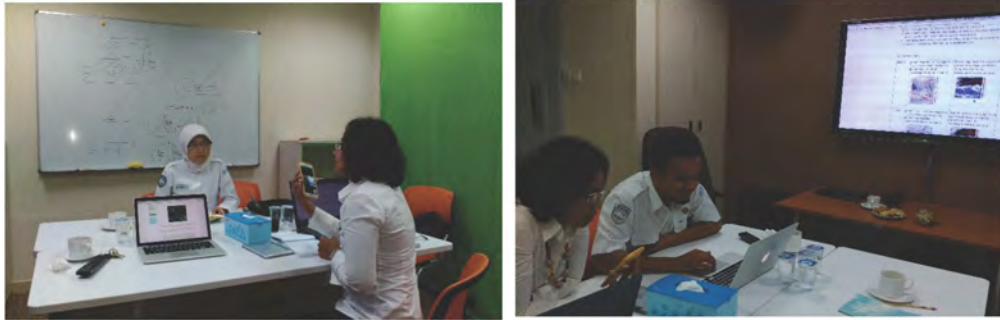


Life Cycle of COL





# DEVELOPMENT WORK (PHASE 2)



Tya, Adit and Roro were consulting CM with Vesa using Hangouts via mobile

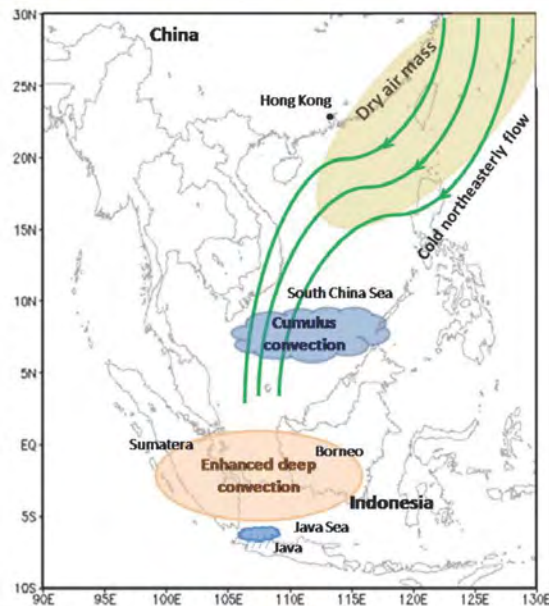


Tya explained her finding in literature survey to the team

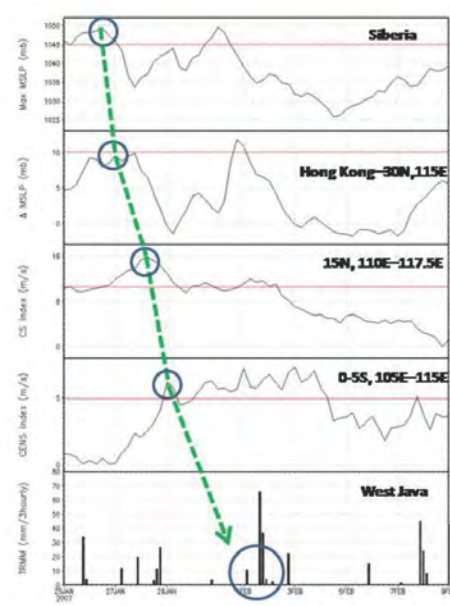


Adit and Roro (Jakarta) was in brainstorming with Rezza (Tokyo) using realtimeboard application and screen sharing facility

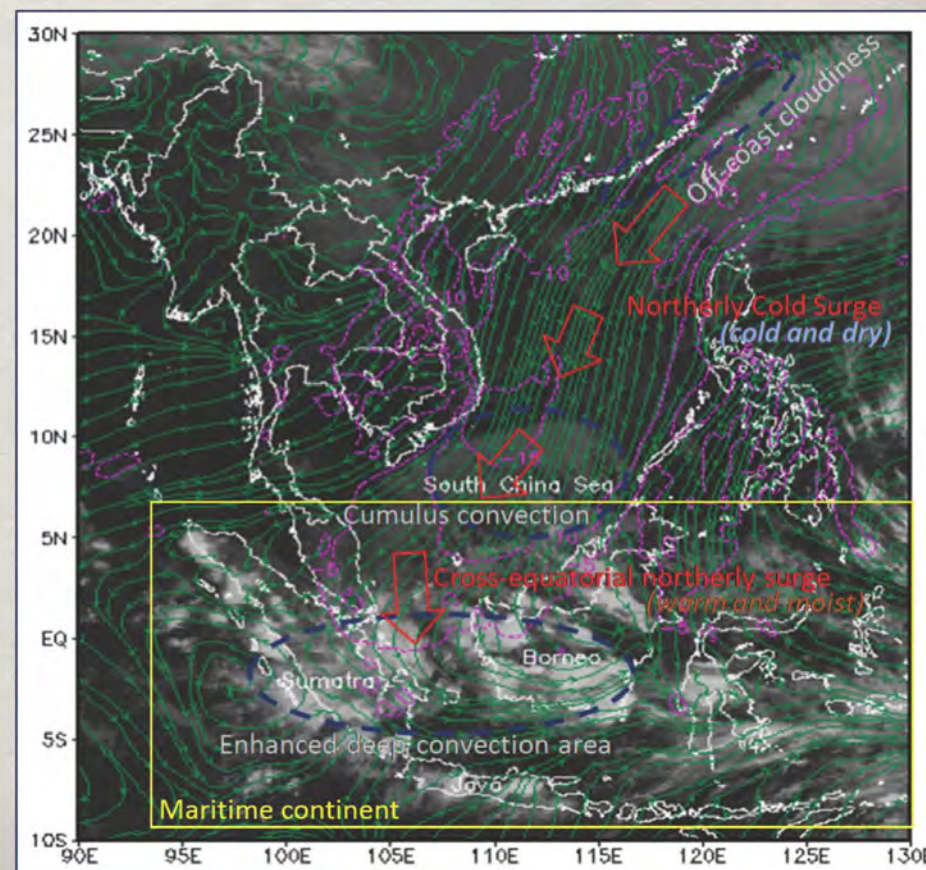
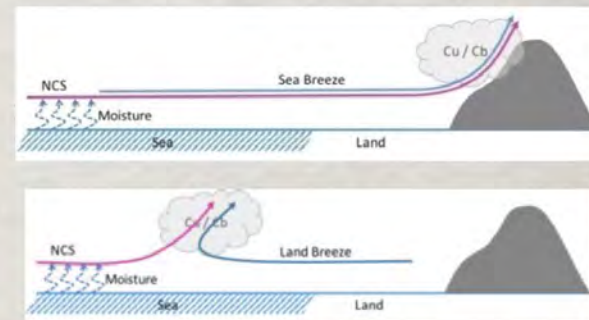
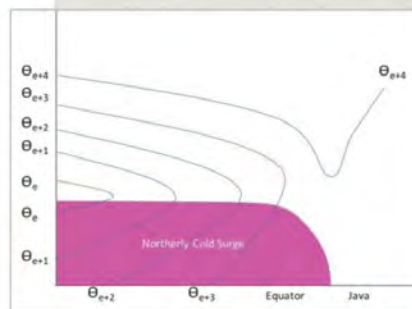




Schematic of an NCS event



Meteorogram showing the track of an NCS event







# VALUE FOR USERS

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- The Meteorological education & training sector
  - Students and teachers, instructors
- The Meteorological forecast centres
  - More efficient work by combining satellite data with many other data;
  - better understanding of weather systems → nowcasting, warnings →
  - Benefit for user of weather forecasts





## VALUE FOR THE VLAB

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- Inspection of the actual training needs of forecasters
- Promote the activities of CoE for the relevant regions
- Reinforce interaction between institutions (university – weather services) and other countries
- Experience in managing virtual teams (~ 30 people, 5 continents, 2 hemispheres)
- Assistance from European experts -> benefit from their background





# FUTURE & SUSTAINABILITY

Showing 48 items

Conceptual Model	Region	Category	Sub-category 1	Sub-category 2	Full CM	Link	Description
Sort ▾	Sort ▾	Sort ▾	Sort ▾	Sort ▾	Sort ▾	Sort ▾	Sort ▾
ZONDA	Argentina	Small scale, local, orographic			✓	Zonda	Föhn at Andes
Shallow Cold Front	Australia	Synoptic Scale	Polar fronts and cloud bands	Cold Fronts	✓	Shallow Cold Fronts	Class II summer cold front: East Australian Southerly Buster; New Zealand Southerly Buster; Central Australian Front
Continental tropical system – tropical Low	South Africa	Tropical			✓	Tropical Lows in Southern Africa	
MCCs	Brazil	Meso and Small Scale	Convective		✓	Mesoscale Convective Complexes (MCCs)	
Rapid Cyclogenesis	Australia	Synoptic Scale	Waves, cyclogenesis, low pressure centers		✓	Explosive Cyclogenesis in the southeast Australian region	
South American Low Level Jet (SALLJ)	Argentina	Synoptic Scale	South Hemisphere Jet	Mid – Low level Jet	✓	SALLJ and MCCs	Connected with convective cloudiness
Convection in central (Altiplano) and subtropical Andes	Argentina	Meso and Small Scale	Convective		✓	SALLJ and MCCs	
SALLJ	Argentine	Meso and Small Scale	Convective		✓	SALLJ and MCCs	Connected to Low level jet
Cut off Low	South Africa	Synoptic Scale	Waves, cyclogenesis, low pressure centers		✓	Cut-Off Low pressure systems	
MCC	Australia	Meso and Small Scale	Convective				

<https://sites.google.com/site/cmsforsh/inventory>





# CM4SH-3?

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Thank you  
for your attention!

CM4SH website:  
<http://www.cm4sh.org>

Vlab website:  
<http://vlab.wmo.int>