

# Overview of UK-COPS



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National Centre for Atmospheric Science and University of Leeds

# UK-COPS details

- Led by National Centre for Atmospheric Science (NCAS)
- 4 universities: Leeds, Manchester, Reading and Salford
- Funded for 3 years, but varied start times: 1 July 2007 - 30 March 2011
- 9 PDRAs (2-3 openings!)

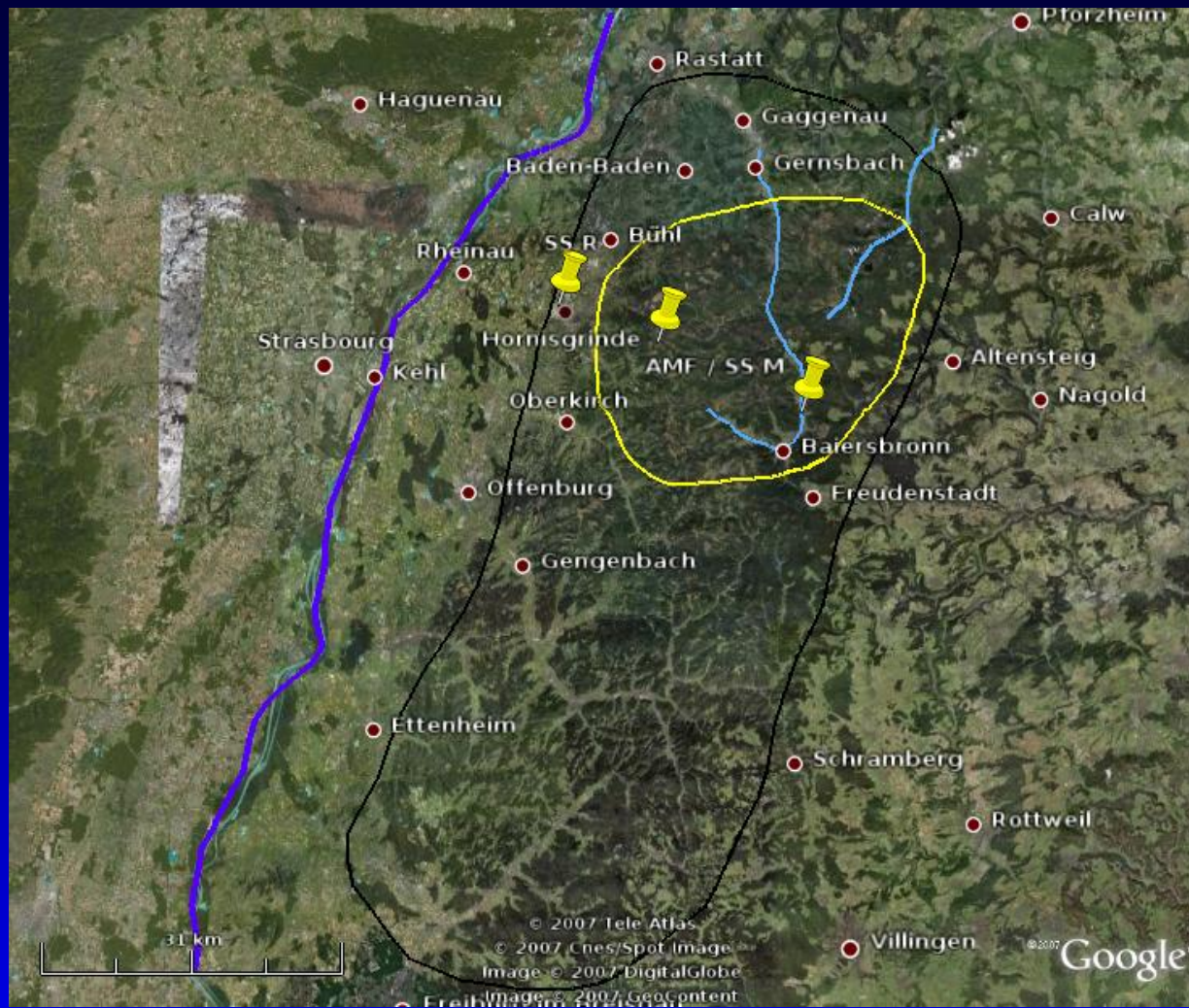
# UK-COPS Science Objectives

1. What are the details of boundary layer structures responsible for the initiation of convection?
2. What are the pathways for heat, mass, water vapour and aerosols to enter terrain-locked convective cells?
3. How is the development of deep convection and precipitation over complex terrain influenced by the cloud/aerosol interaction?

# Ground-based measurements

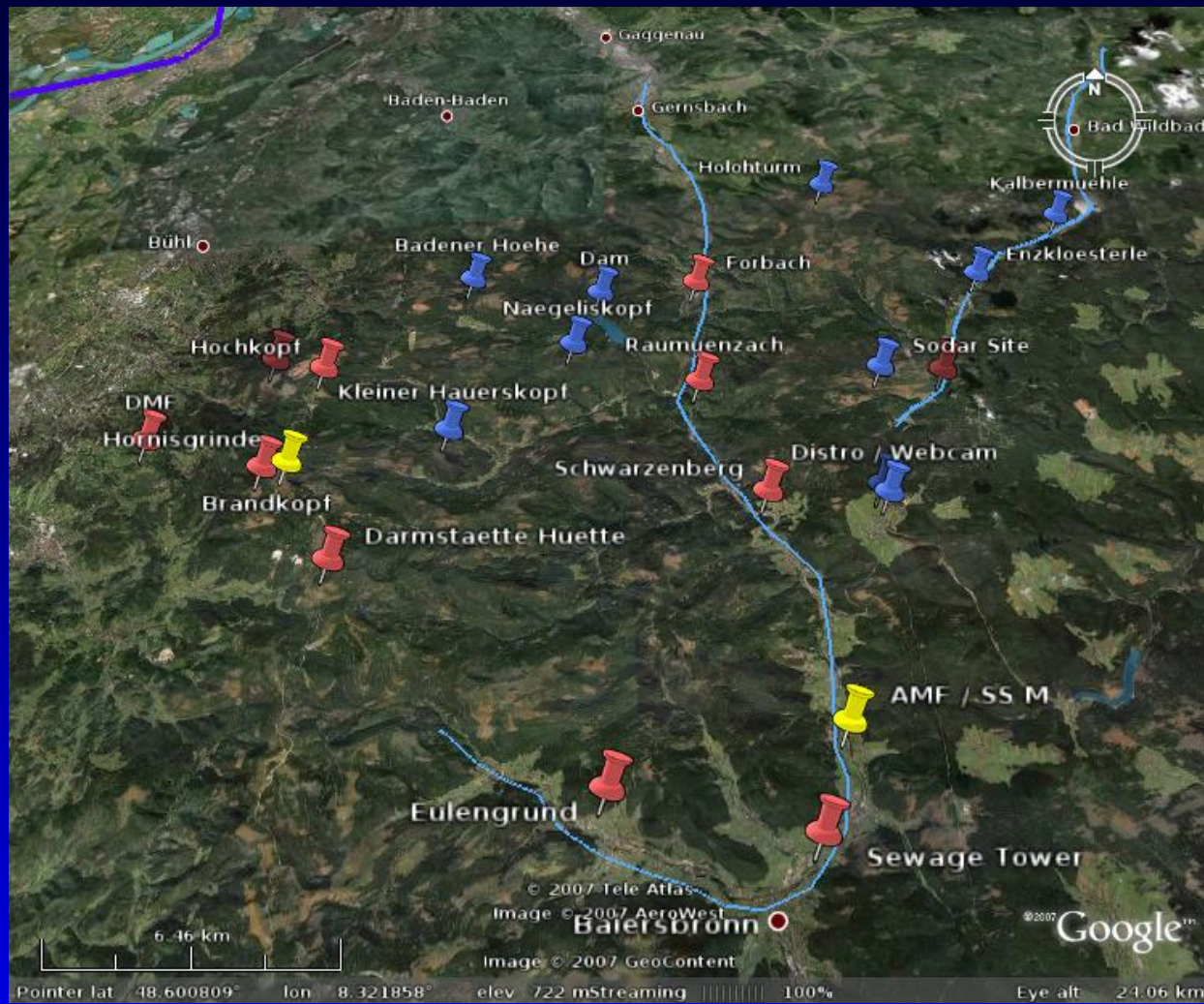
<b>Instruments</b>	<b>Location</b>	<b>Contacts</b>
Aerosols	Hornisgrinde	Jonny Crosier, Hugh Coe
Wind profiler	Achern	Emily Norton, Geraint Vaughan
Doppler Lidar	Achern	Fay Davies, Chris Collier
Radiometer	Achern	Fay Davies, Chris Collier
Sodars	Achern Enzklösterle	Barbara Brooks
AWSs	Various	Vicoria Smith, Stephen Mobbs Simon Hölzl, Alexander Gohm
Radiosondes	Achern Hornisgrinde	Stephen Mobbs

# COPS AWS Sites: overview



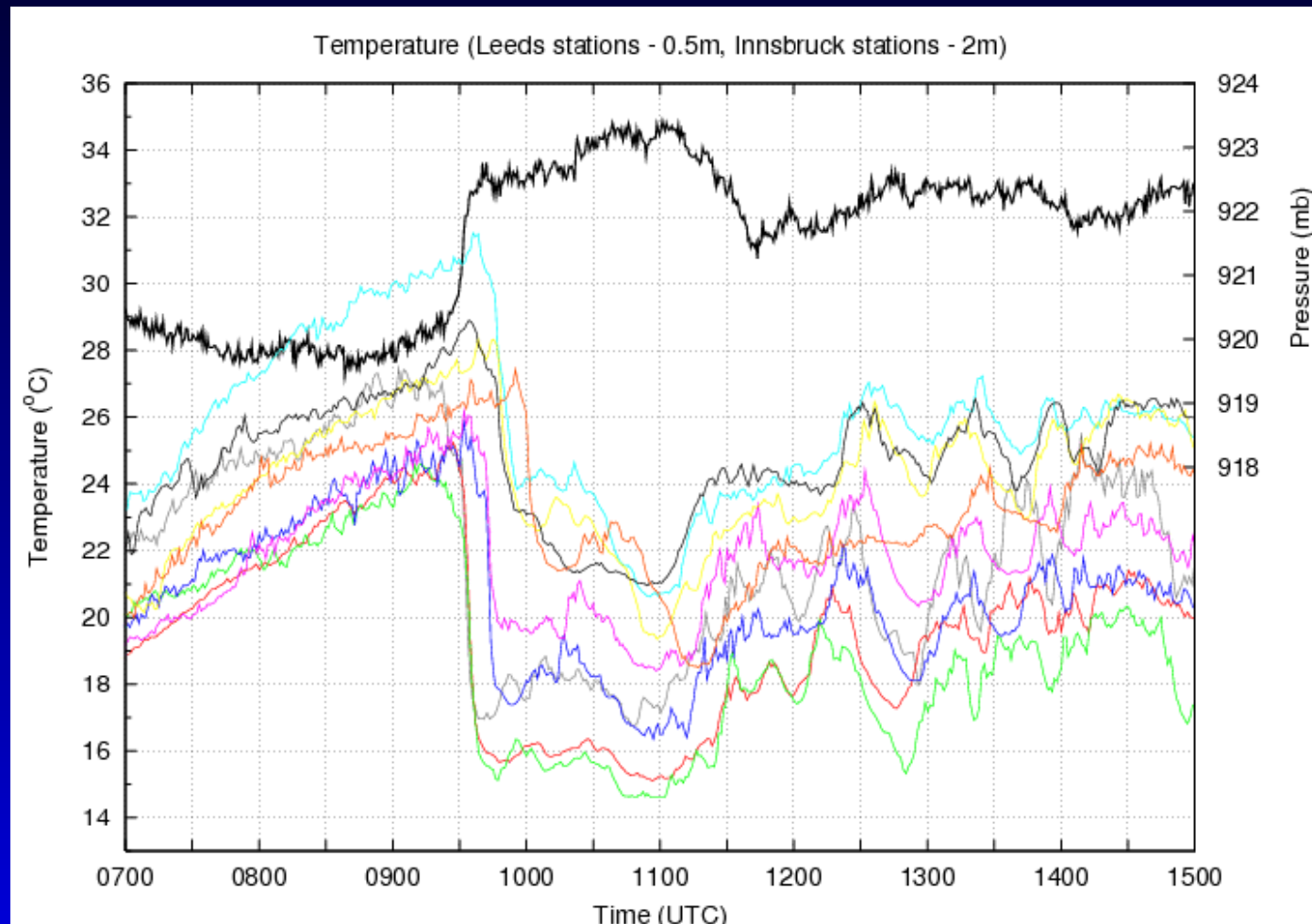


# COPS AWS Sites: details



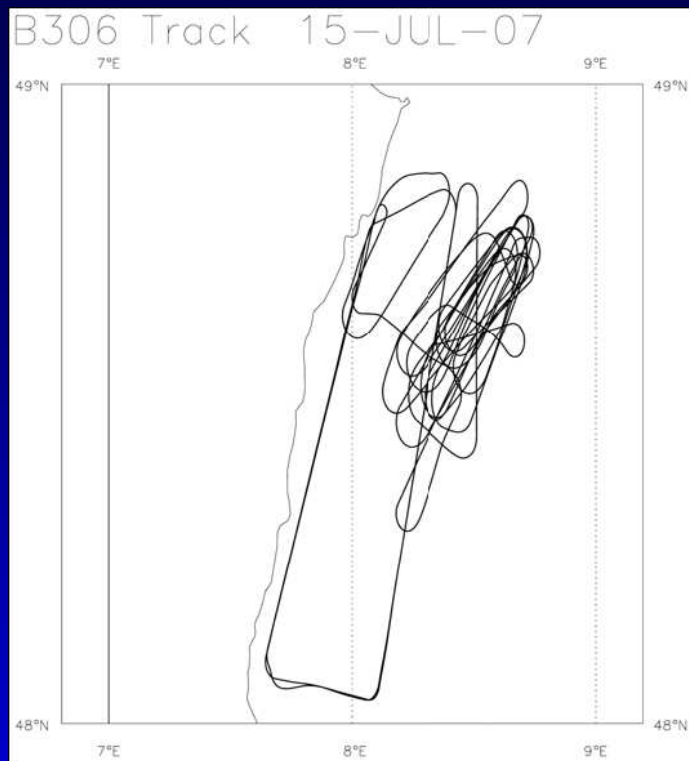
See poster by Victoria Smith

# COPS AWS data: Cold front, 20 July



See *Victoria Smith* for additional plots

# BAE 146



- Aerosol legs in Rhine Valley and foothills
- Penetrations of convective clouds in Boxes A and B
- Ascent with cloud tops – fresh turrets

More in Talk in 6th Session (ACM) tomorrow



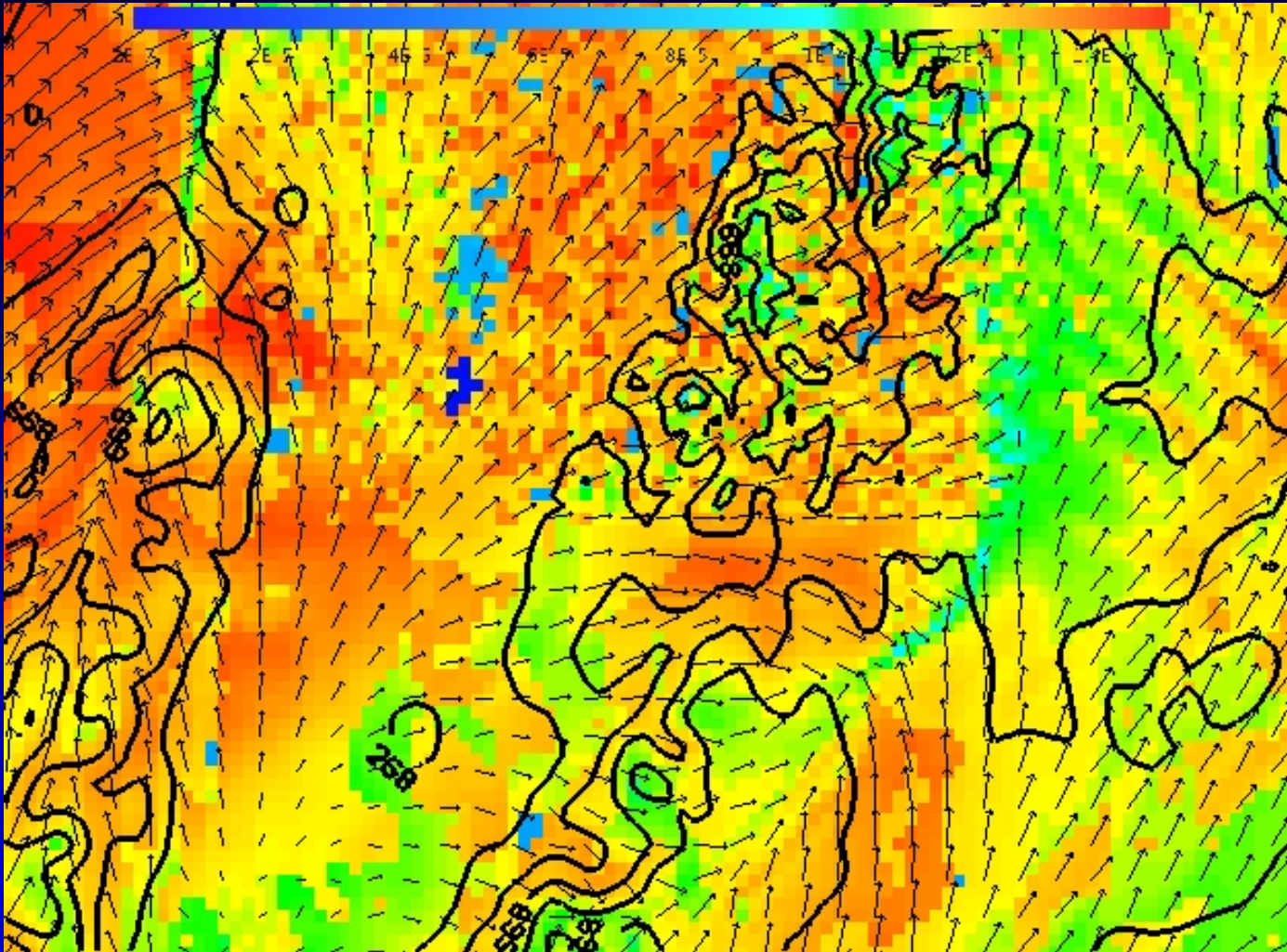
# UK-COPS Research 1

## 1. Convective Initiation

- **Study of initiation mechanisms using WRF model** – Alan Gadian, Ralph Burton
- **Flow over complex terrain** – Stephen Mobbs, Victoria Smith, Alan Gadian, Ralph Burton, Leeds PDRA
- **Orographic Generation of Convection** – Victoria Smith, Stephen Mobbs
- **Lids** – Andrew Russell, Geraint Vaughan, Alan Blyth
- **Boundary-layer structures and surface fluxes** – Fay Davies, Chris Collier, Jenny Davis, Alan Blyth
- **Boundary-layer processes / CI** – Alan Blyth, Tammy Weckwerth, Alan Gadian, Leeds PDRA

Next

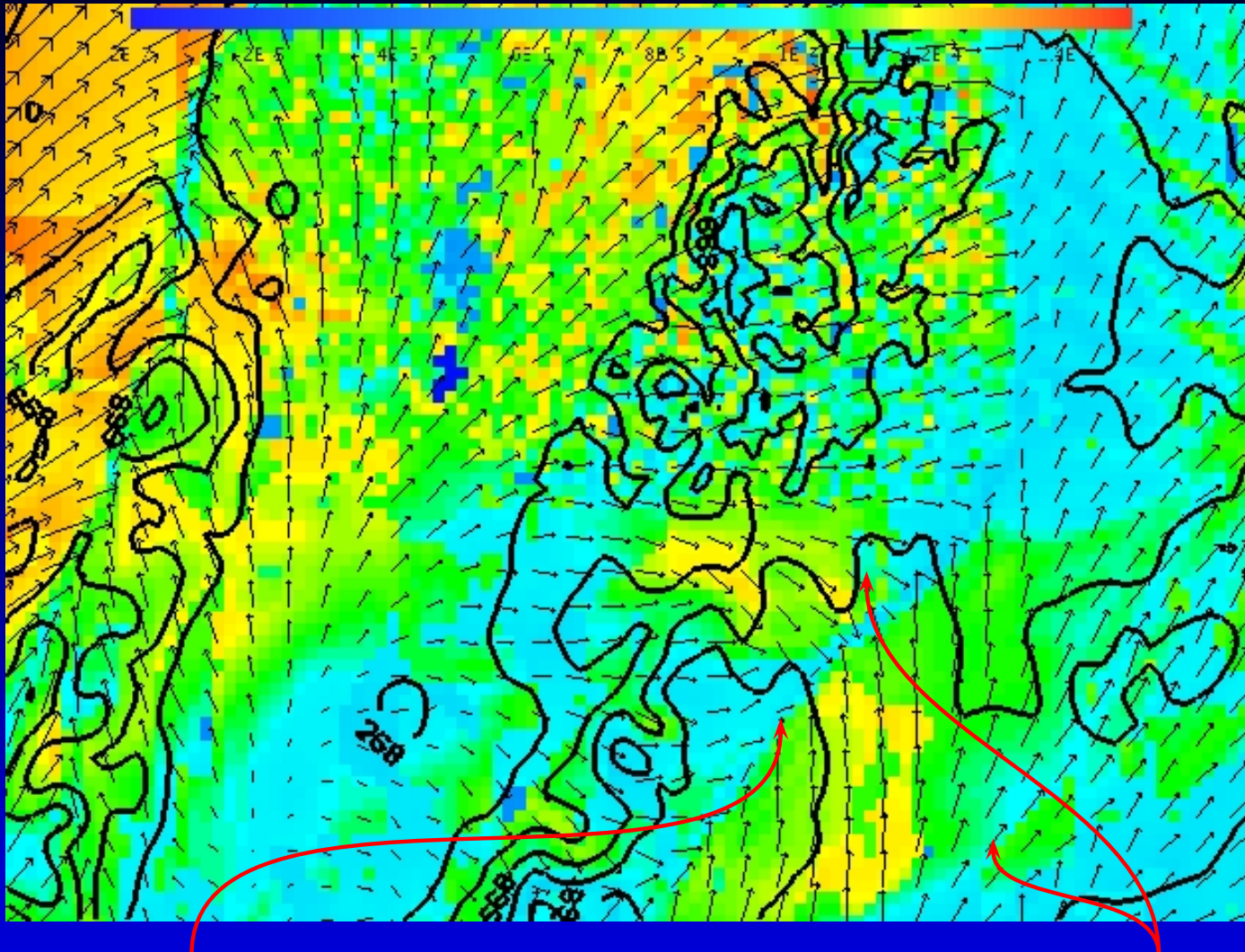
# WRF model: 15 July, 14Z



Upward moisture flux and wind vectors; Resolution 2.1 km.

*Ralph Burton and Alan Gadian*

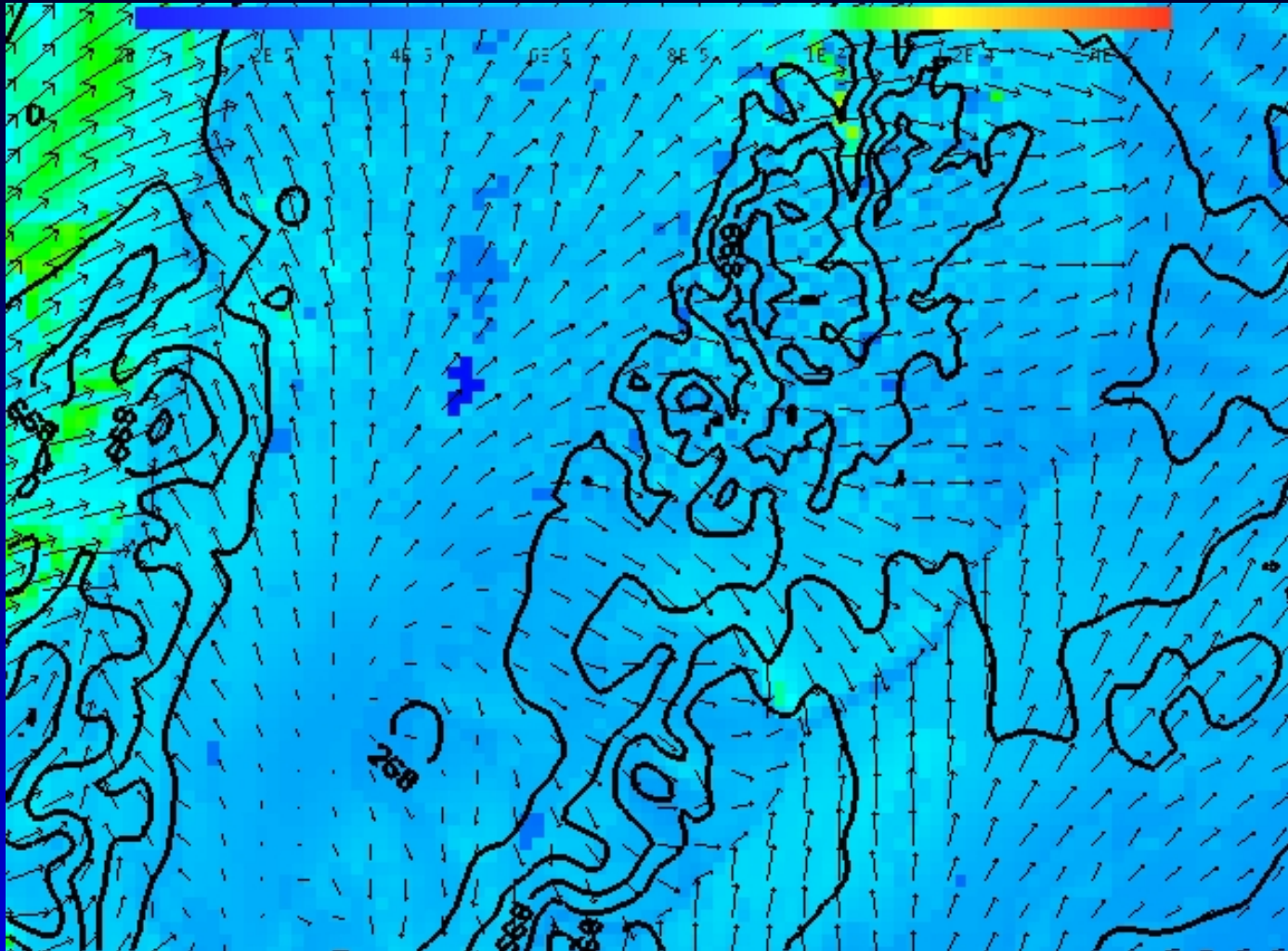
# WRF Model: 15 July, 15Z



**Strong convergence**; relatively **high** upward moisture flux “**upwind**” of the convergence line.



# WRF Model: 15 July, 16Z



Strong convergence; relatively low upward moisture flux “upwind” of the convergence line.



# WRF Model: 15 July case

*Ralph and Alan*

Initial impressions of (2.1 km resolution) WRF results:

- Strong convergence zone in region of observed cloud; similar orientation
- Convergence zone forms about 13Z and persists until 16Z
- Upward moisture flux decreases by 16Z
- Agrees with observations: the cloud had diminished by 16Z

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# UK-COPS Research 2

## 2. Aerosols and Microphysics

- **Characterisation of aerosols in boundary layer** – Jonny Crosier, Hugh Coe, Tom Choularton, Hazel Jones
- **Microphysics and dynamics of convective clouds and role of aerosols (modelling and observations)** – Alan Blyth, Alan Gadian, Tom Choularton, Hugh Coe, Ken Carslaw, John Cardwell, Hazel Jones, Leeds PDRA
- **Modelling dynamics and microphysics using WRF** – Alan Gadian, Ralph Burton, Alan Gadian

# UK-COPS Research 3

## 3. Precipitation

- **Precipitation distribution and quantity from AWSs** – Simon Hölzl, Alexander Gohm, Victoria Smith, Stephen Mobbs
- **Development of warm rain; development of graupel and hail; role of aerosols in quantity of precipitation** – Alan Blyth, Leeds PDRA
- **Quantity of precipitation predicted by UM** – Peter Clark, Alan Blyth

## 4. Model studies, predictability

- **Evaluation of WRF model** – Alan Gadian, Ralph Burton
- **Predictability of UM** – Pete Clark, Stephen Belcher, Reading PDRA
- **Comparison of observed cloud properties at AMF COPS site with UM** – Ewan O'Connor, Anthony Illingworth

# UK COPS PDRAs

PDRA	Name	Task	University
1	<b>Vacant</b>	Orographic Flow	Leeds
2	John Cardwell	Microphysics modelling	Manchester
3	Andrew Russell	BL properties	Manchester
4	Jenny Davis	BL dynamics	Salford
5	<b>Vacant</b>	BL processes / CI	Leeds
6	<b>Vacant</b>	Microphys	Leeds
7	Hazel Jones	Aerosols	Manchester
8	Begin Sept	UM predict	Reading
9	Ewan O'Connor	ARM/model comp	Reading