The 1962 Severe Windstorm in Sheffield, Yorkshire

Ralph Burton, NCAS Weather

Stephen Mobbs, NCAS Director

- Storm started at approx 4Z
- Continued for ~ next 8 hours
- Mean wind speed of ~20m/s, gusts of up to 40 m/s
- Severe gales extended over a wide region –
  but very localised

THE TIMES SATURDAY FEBRUARY 17 1962

Pylons blown down in yesterday's gale. That on left held floodlights at Sheffield United football club's ground at Bramall Lane. The other was the support, on the Jarrow side of the river Tyne, for power cables crossing the river.

£586M. SUBSIDY TO W. GERMAN FARMERS

IMPROVING LIVING STANDARDS

From Our Own Correspondent

BONN, FEB. 16

The Federal Government proposes to give DM.2,060m. (about £183m.) in subsidies to west German agriculture in

NINE DIE IN GALES: GUSTS REACH 177 M.P.H.

70,000 HOUSES DAMAGED IN SHEFFIELD DISASTER

Nine people died and many were injured in gales which raged over parts of Britain yesterday. In North

the German blitz in December, 1940. Whole streets were blocked with rubble, slate, glass and loose masonry. Many

RUSSIA CLAIMS AIR CORRIDOR CONTROL

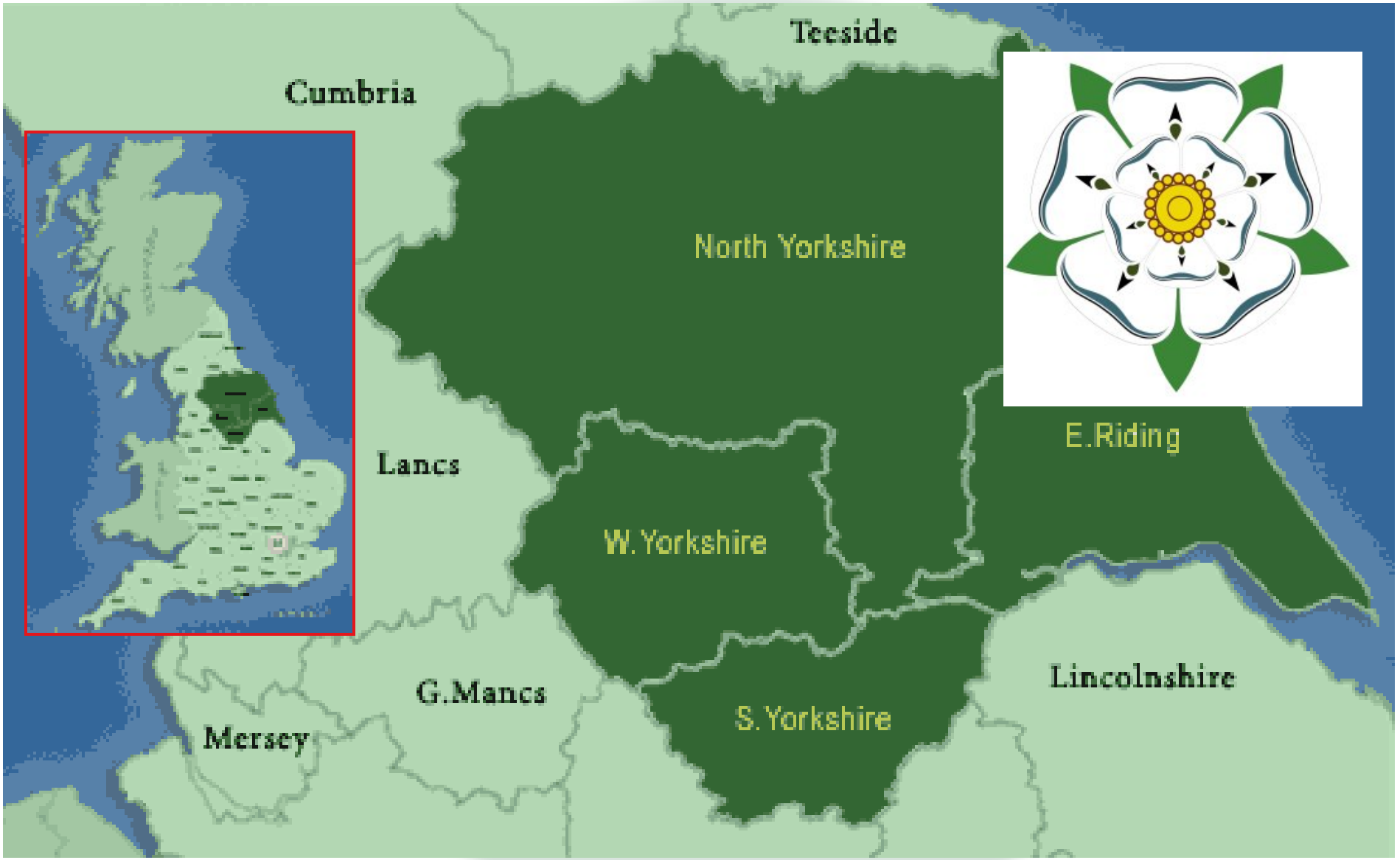
NEW DEMAND FOR RESERVATION

From Our Correspondent

BERLIN, FEB. 16

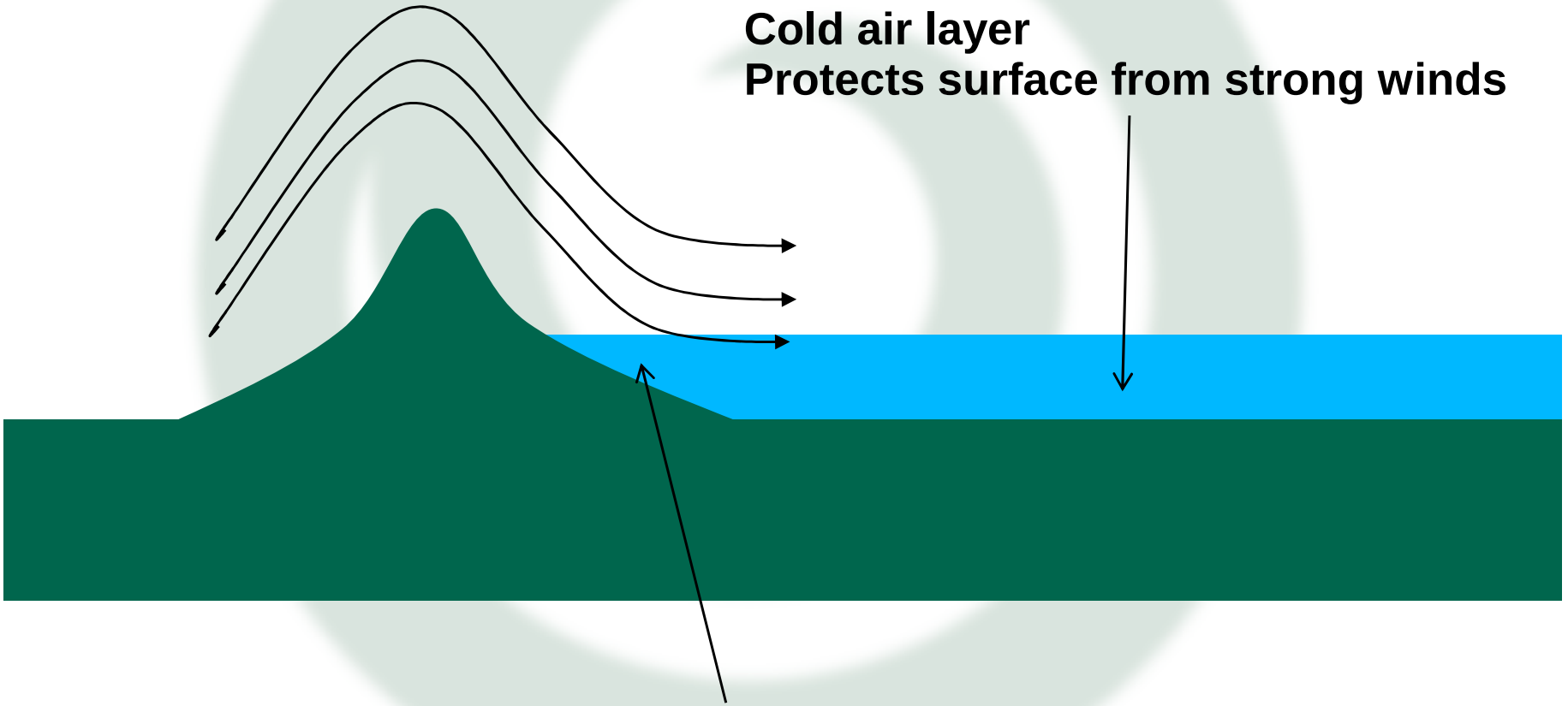
The protest of the western powers to Russia over recent incidents in the air

Actually 110,000
(out of a total of 161,000)


Teeside
Cumbria
North Yorkshire
E.Riding
Lancs
W.Yorkshire
G.Mancs
S.Yorkshire
Lincolnshire
Mersey

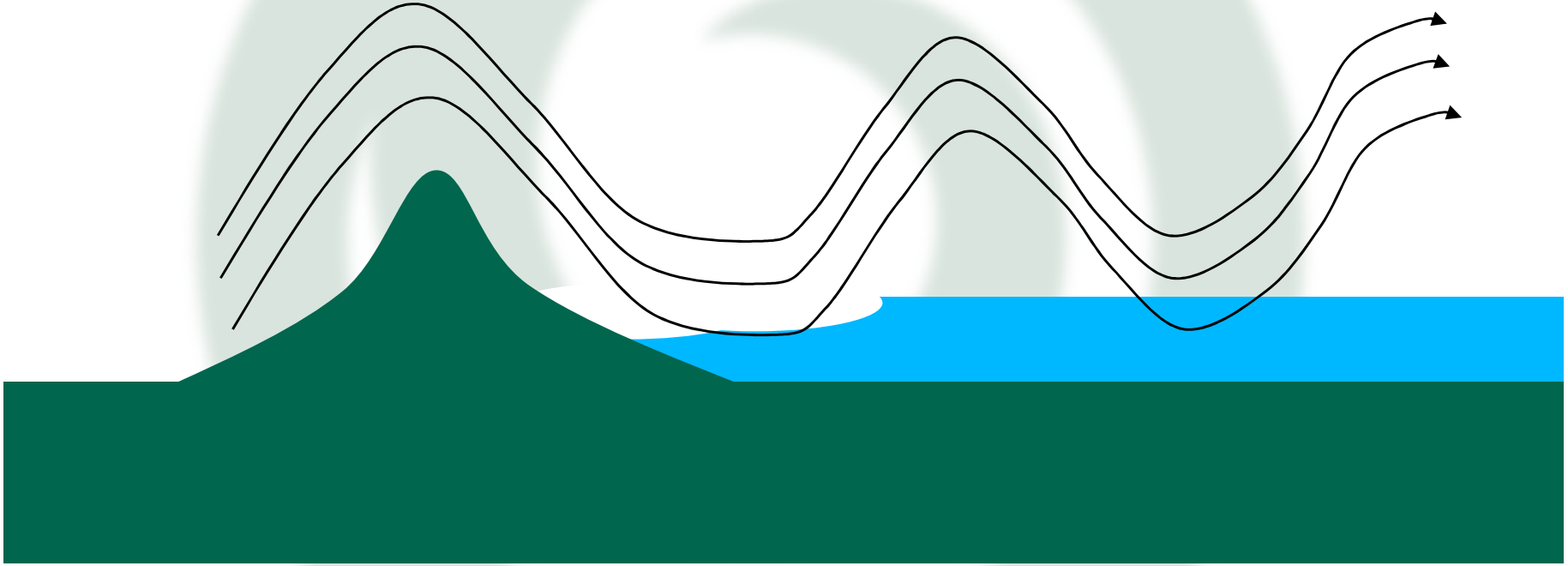
Downslope Winds I.

Winds normal or near-normal to ridge

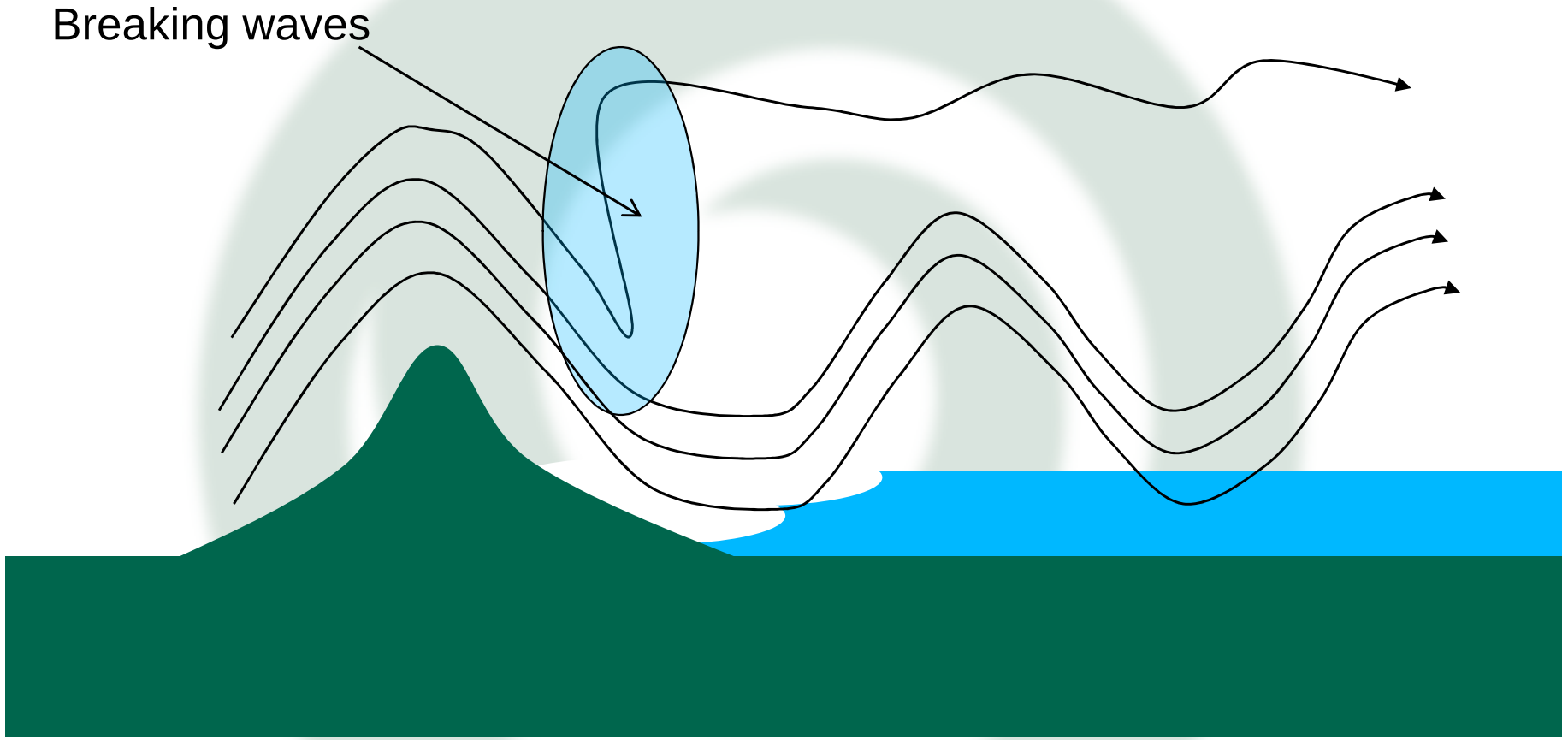


Downslope Winds II.

Wave starts to depress edge of cold layer

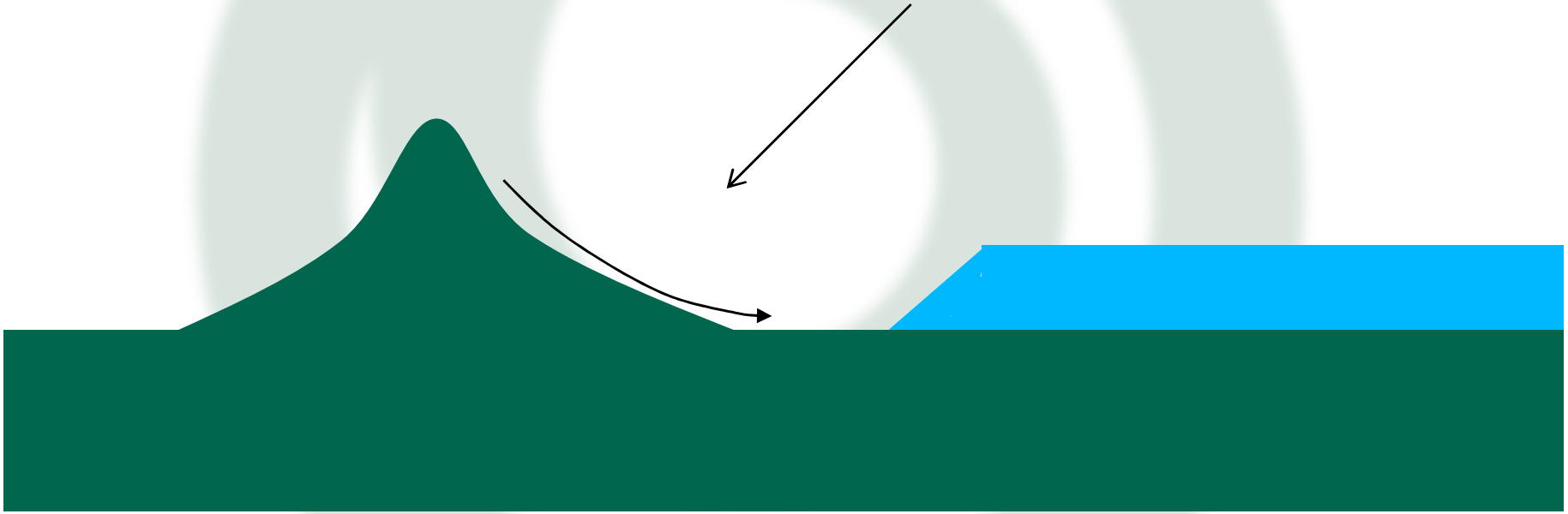


Downslope Winds III.

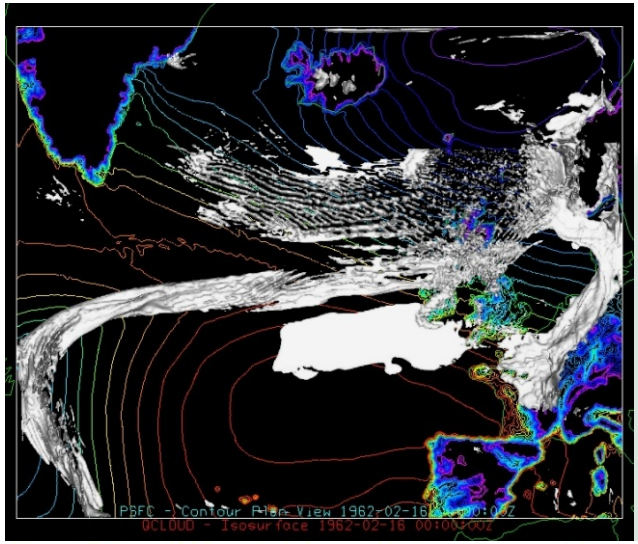


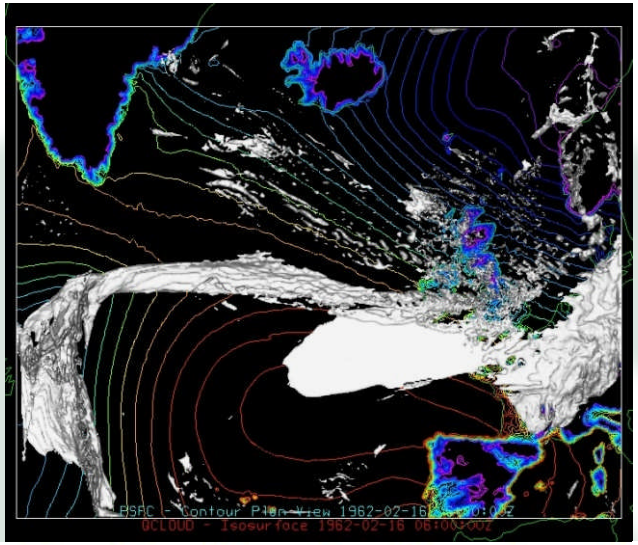
Downslope Winds IV.

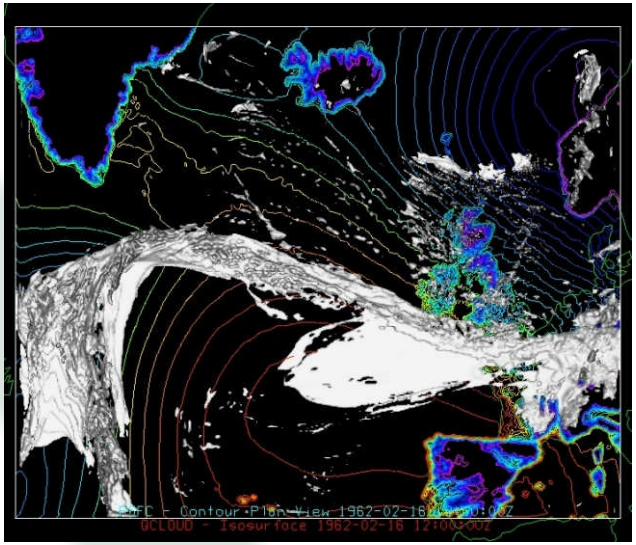
Strong winds can reach surface

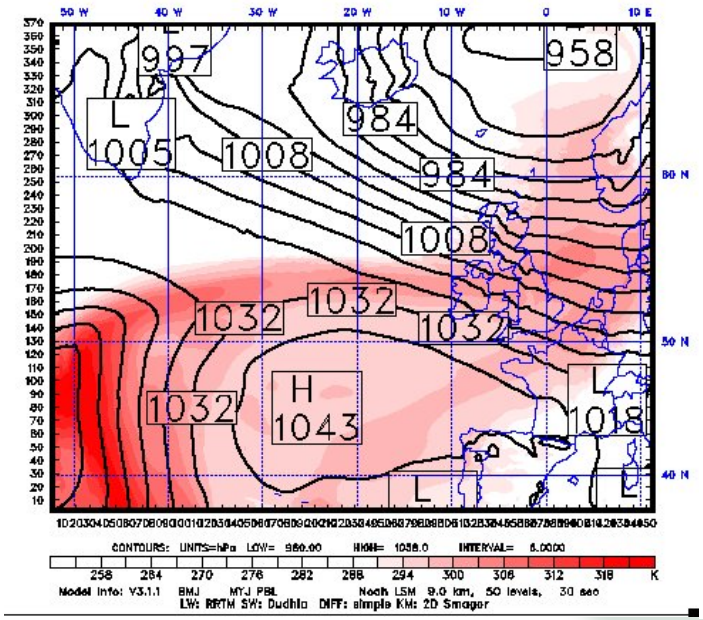


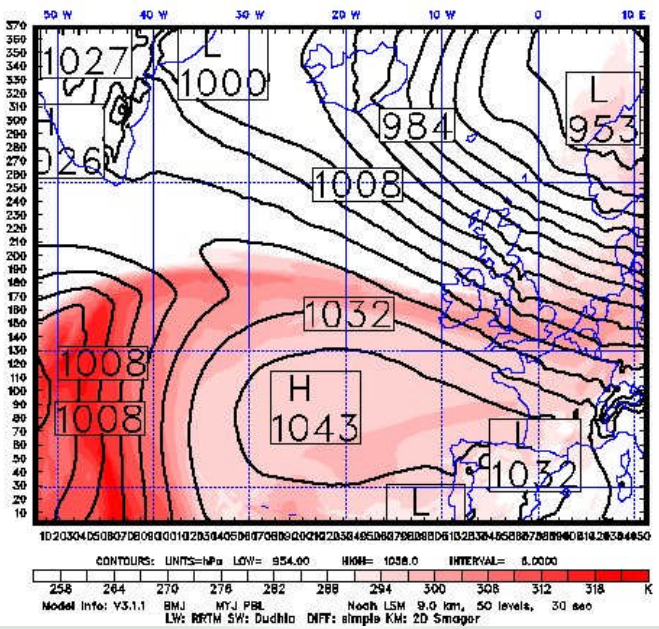
0Z 6Z 12Z

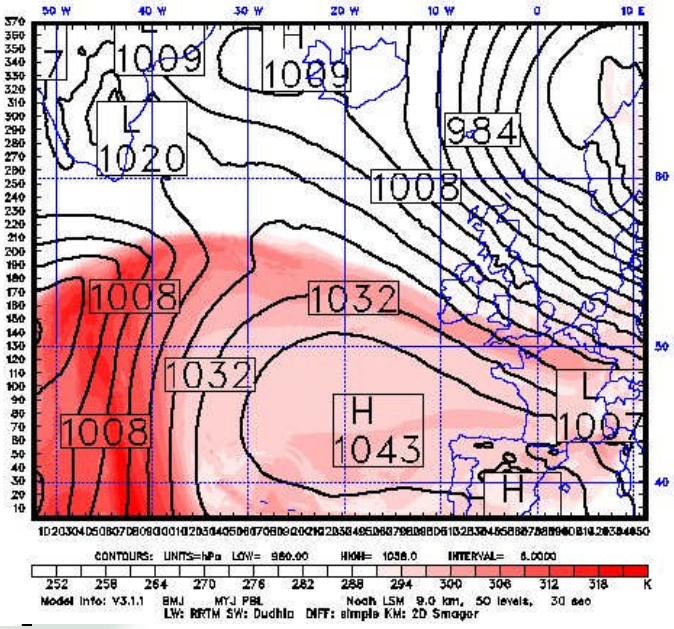








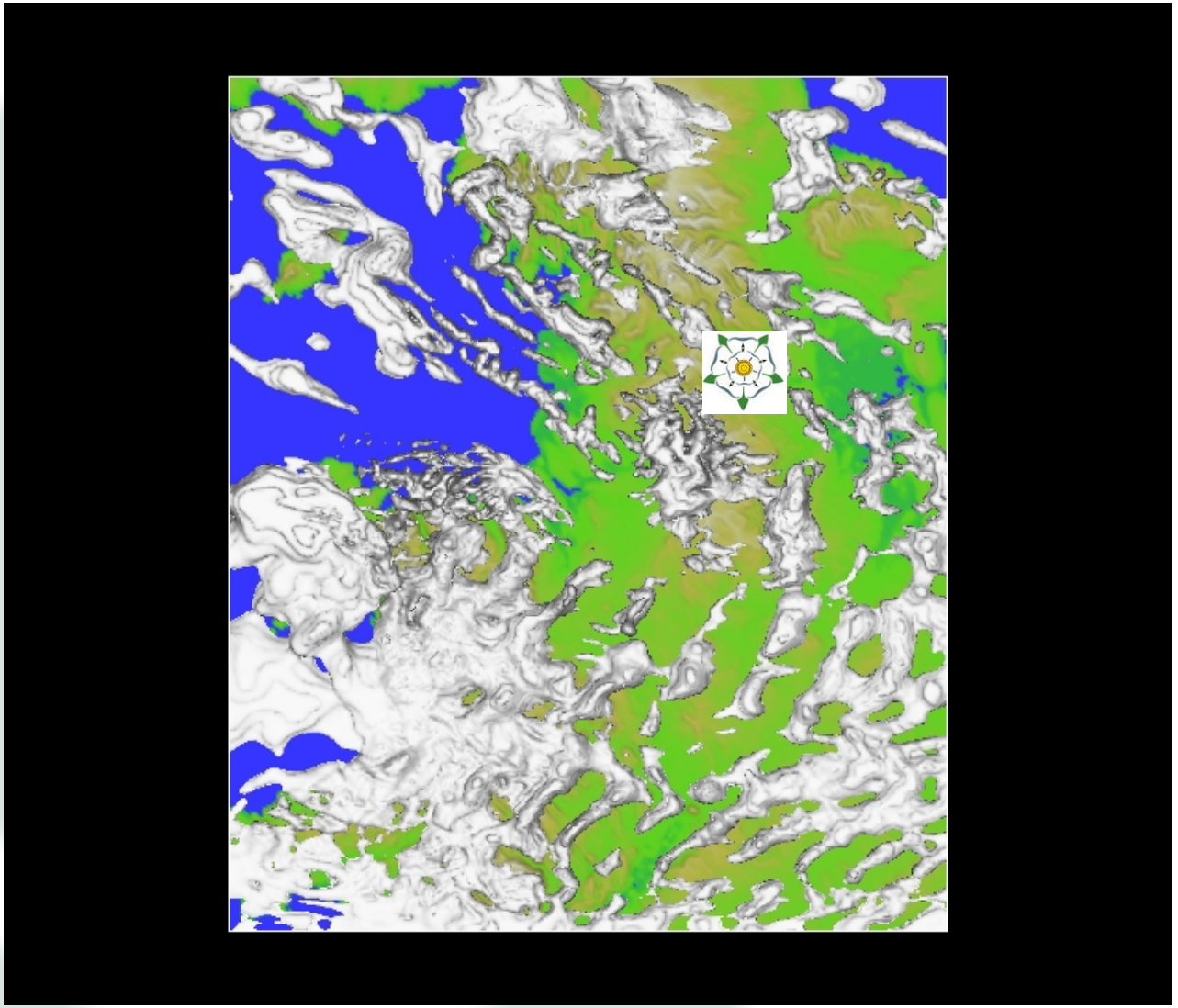




Synoptic situation

Waves?

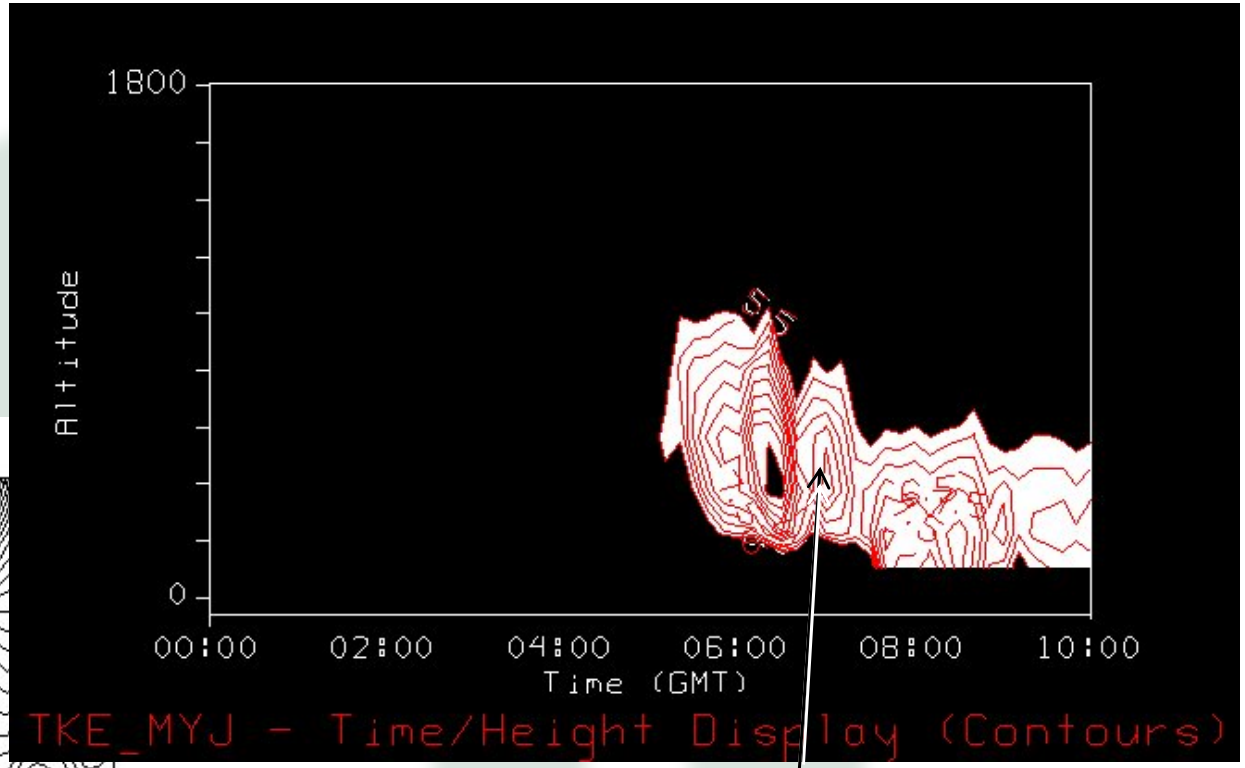
YES

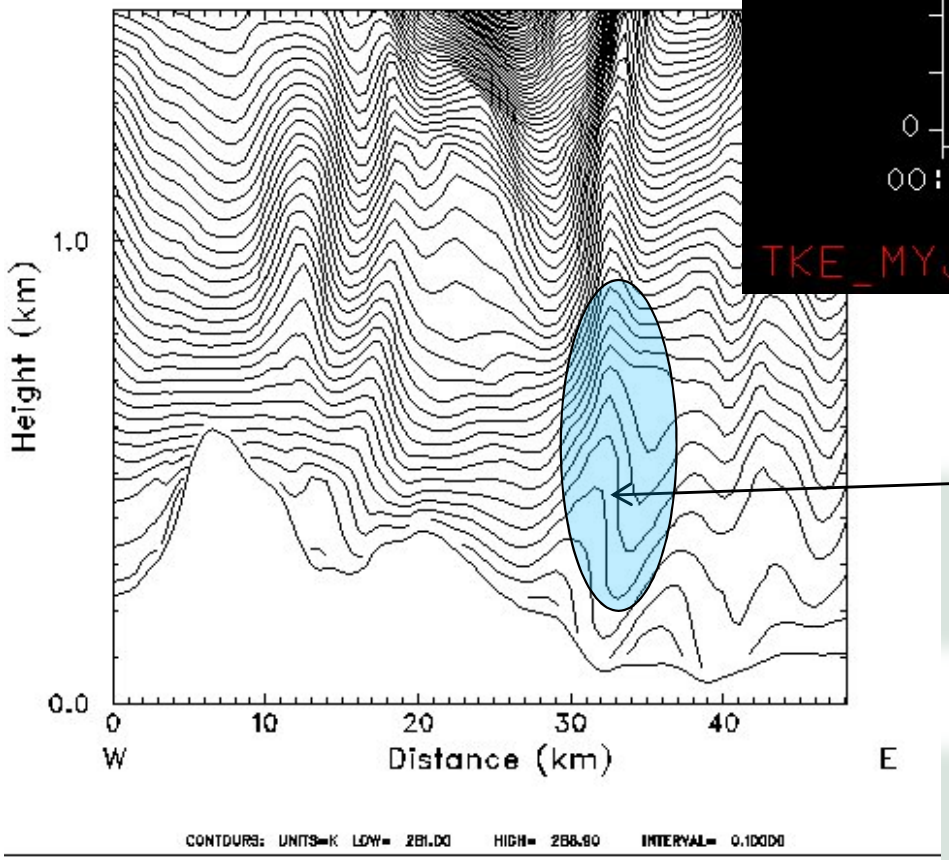


Inner domain, 0640Z

Breaking waves?

YES





Waves breaking, turbulent response

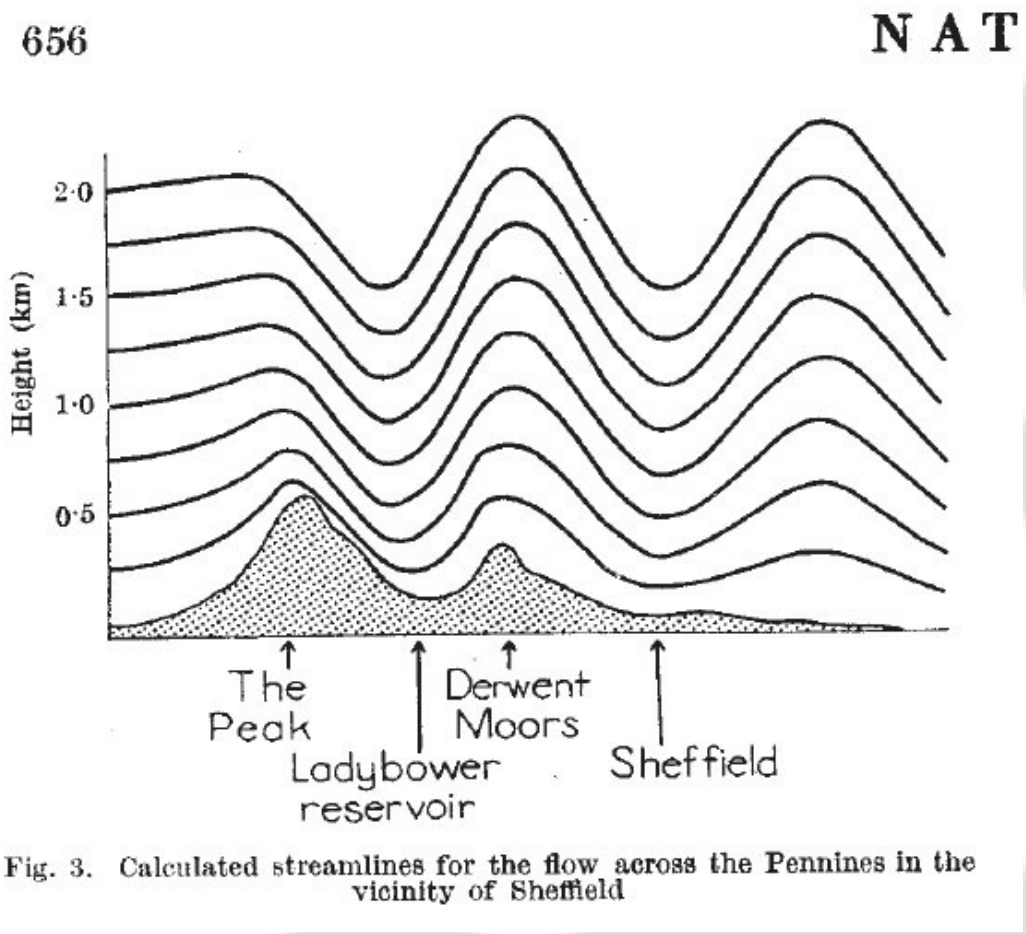


Fig. 3. Calculated streamlines for the flow across the Pennines in the vicinity of Sheffield

2D, steady state,
no variation of U with height,
small ridges only

Aanensen and Sawyer, "The Gale of February 16th ,1962 , in the West Riding of Yorkshire", *Nature*, Feb. 1963

Numerical method described in Sawyer, *QJRMS* 1960..."results...cannot be regarded as applying to flow over ridges of greater height than 200 or 300m"

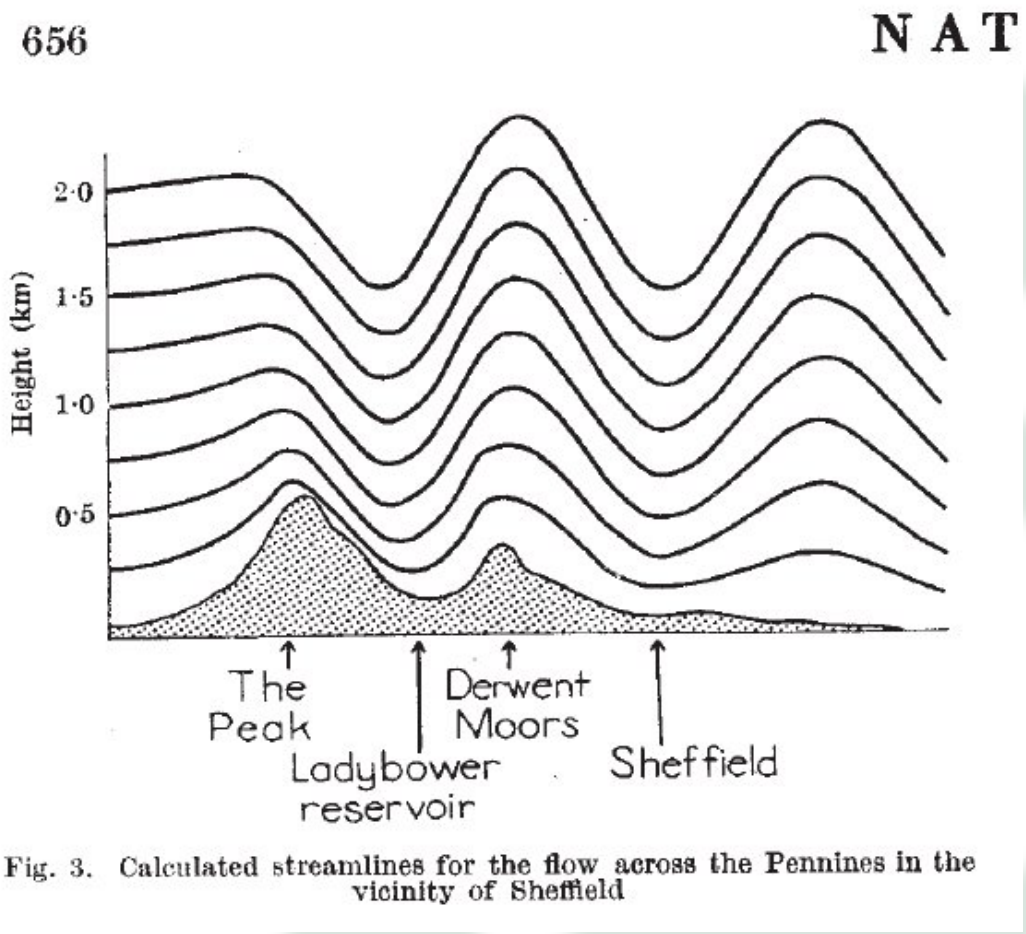


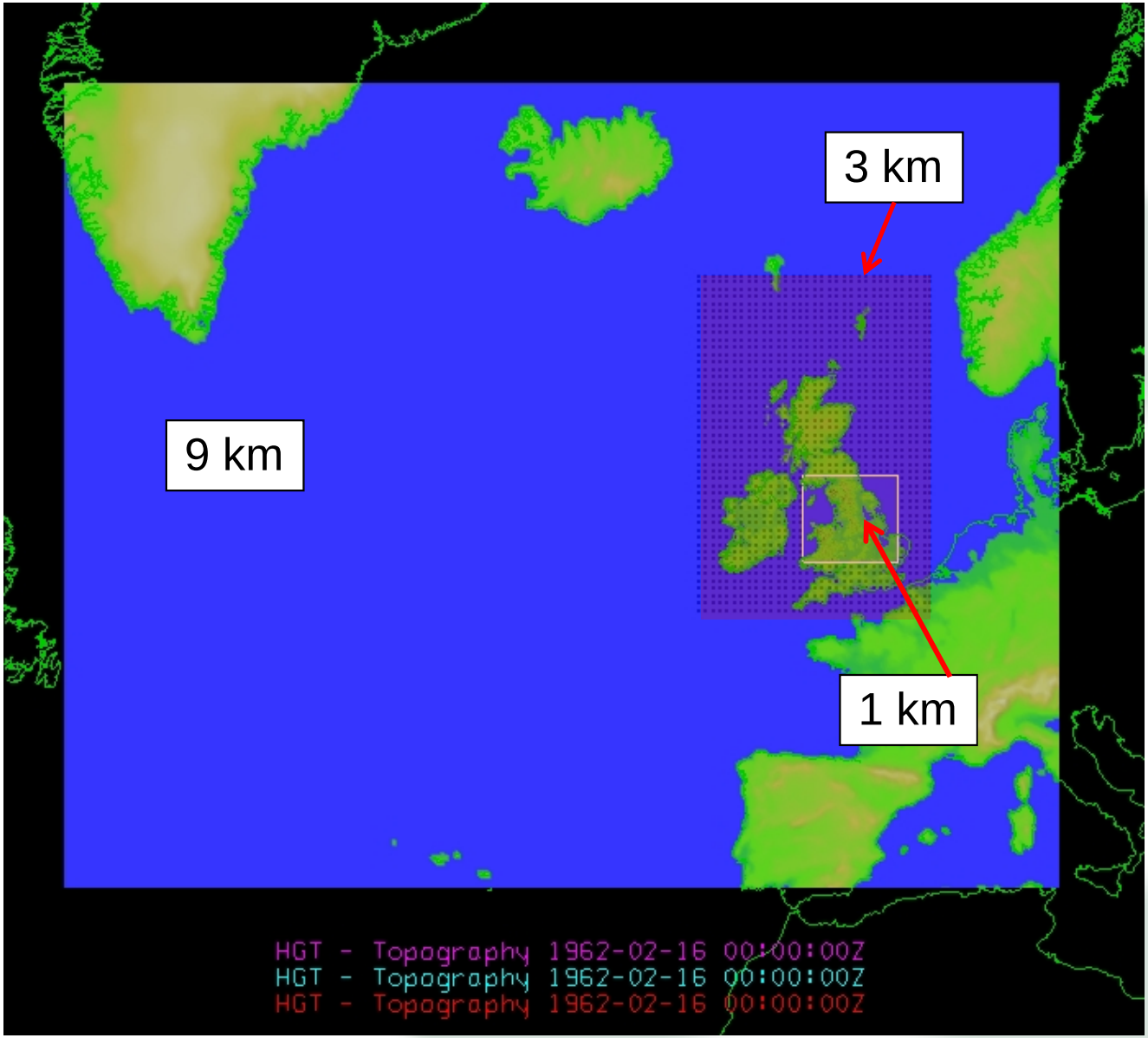
Fig. 3. Calculated streamlines for the flow across the Pennines in the vicinity of Sheffield

2D, steady state,
no variation of U with height,
small ridges only
Computerised solution, on the "Meteor" computer

3000 calculations / second

cf. WRF runs performed on HECToR, 570 million million caclculations /second

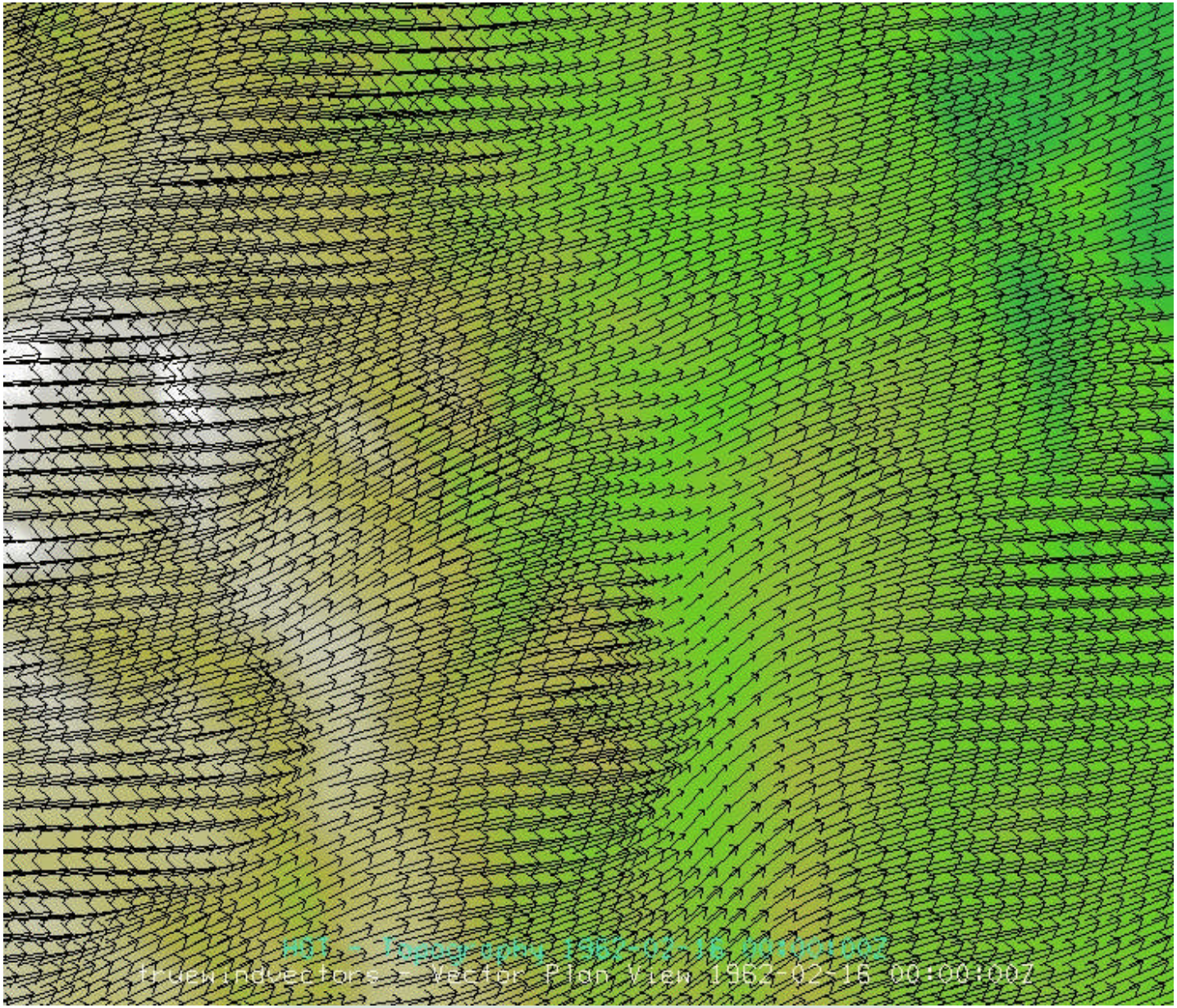
Synoptic situation



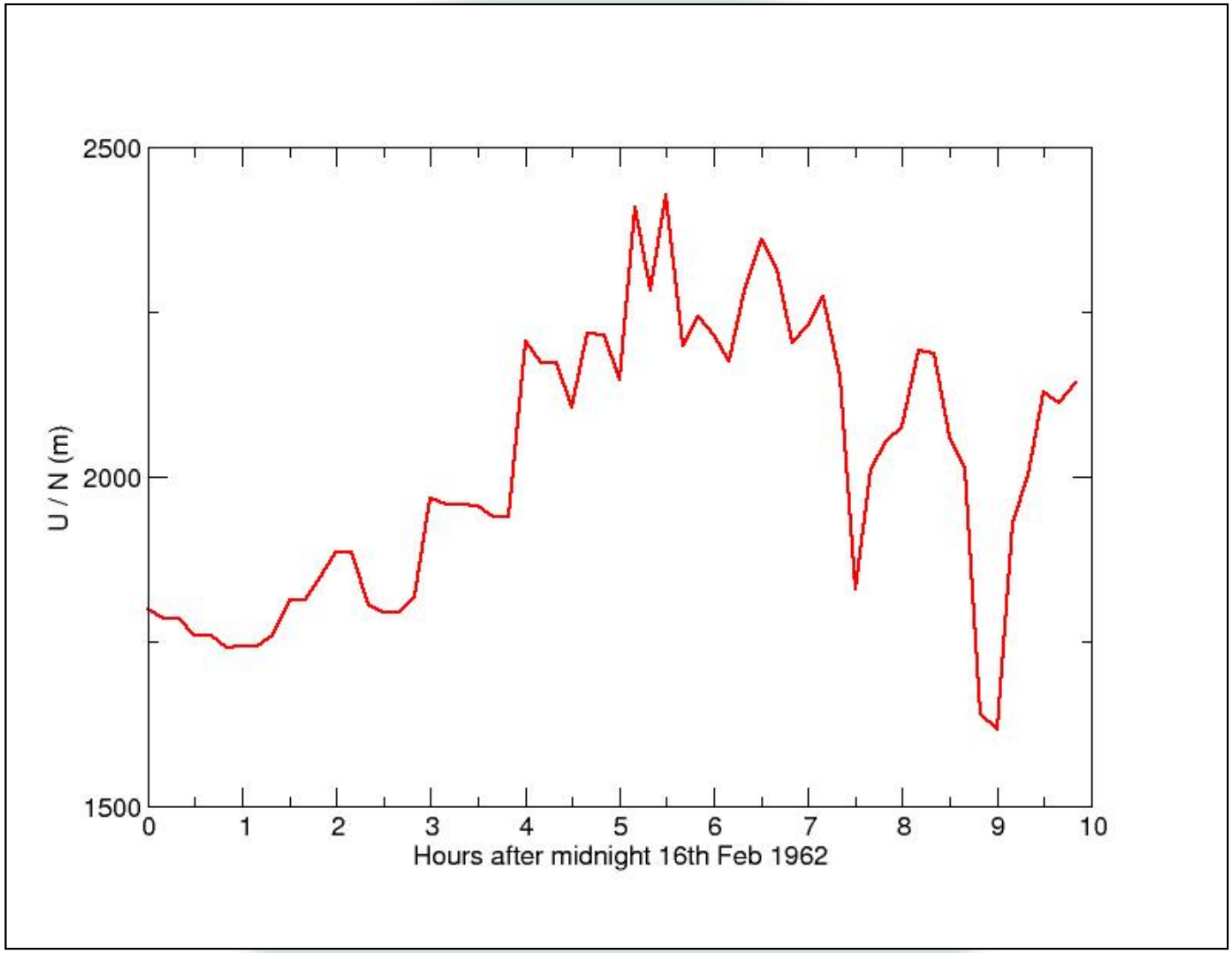
- 80 vertical levels
- Morrison microphysics
- TKE PBL
- NOAH land surface
- SW, LW, etc.
- SRTM 90m orog-graphy of Yorkshire

Initialised with ERA 40 analyses T159, 16 levels

WRF configuration

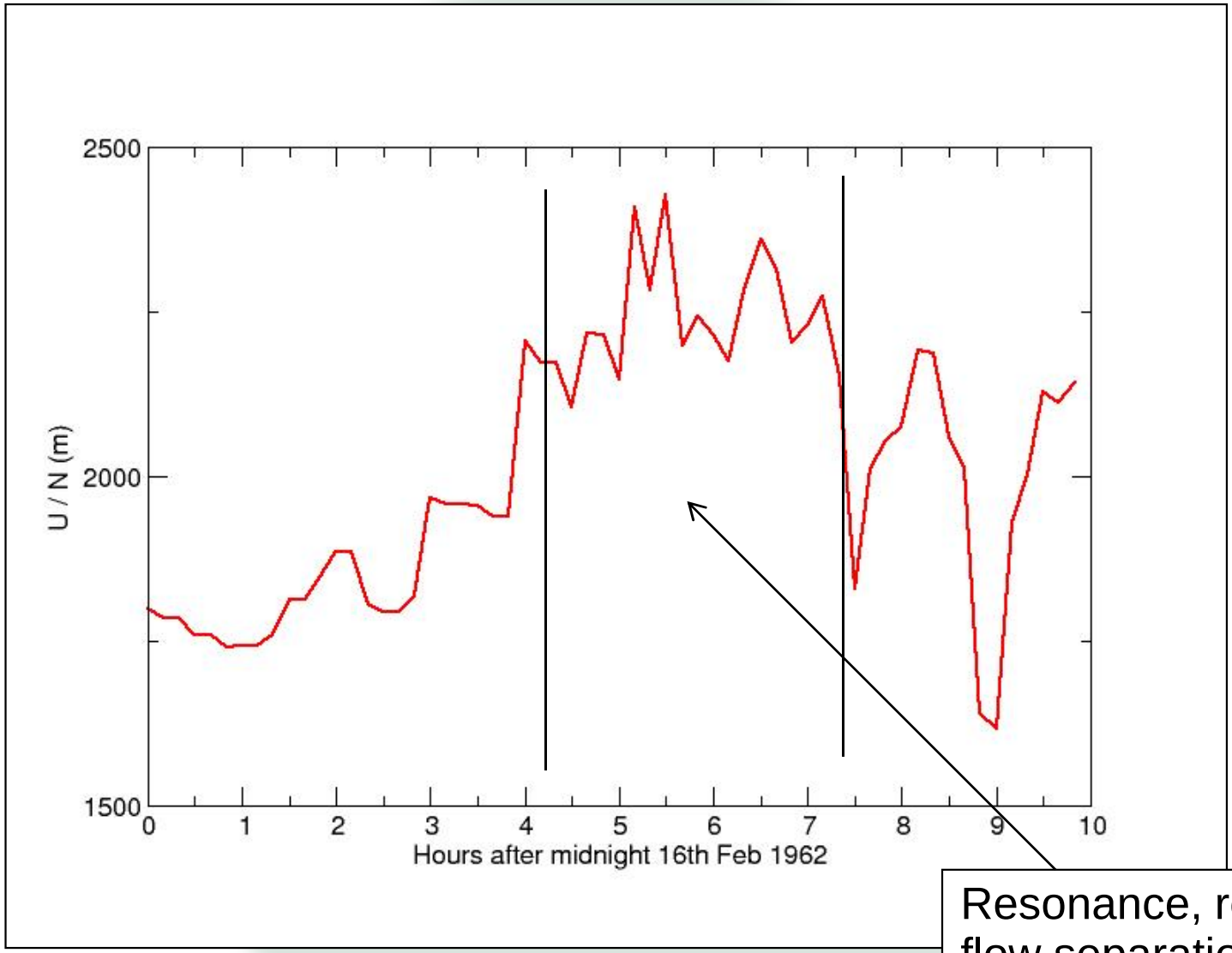

HGT - Topography 1962-02-16 00:00:00Z
truewindvectors - Vector Plan View 1962-02-16 00:00:00Z

Variation in upstream conditions



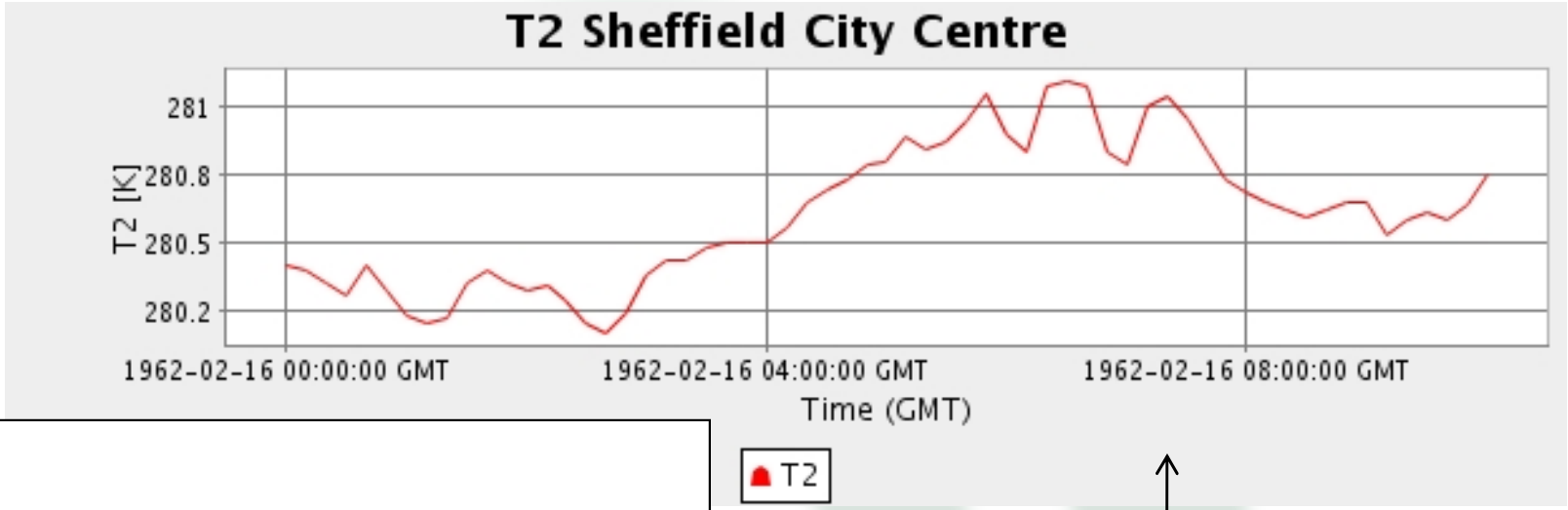
Variation in upstream conditions

Response downstream is more nonlinear

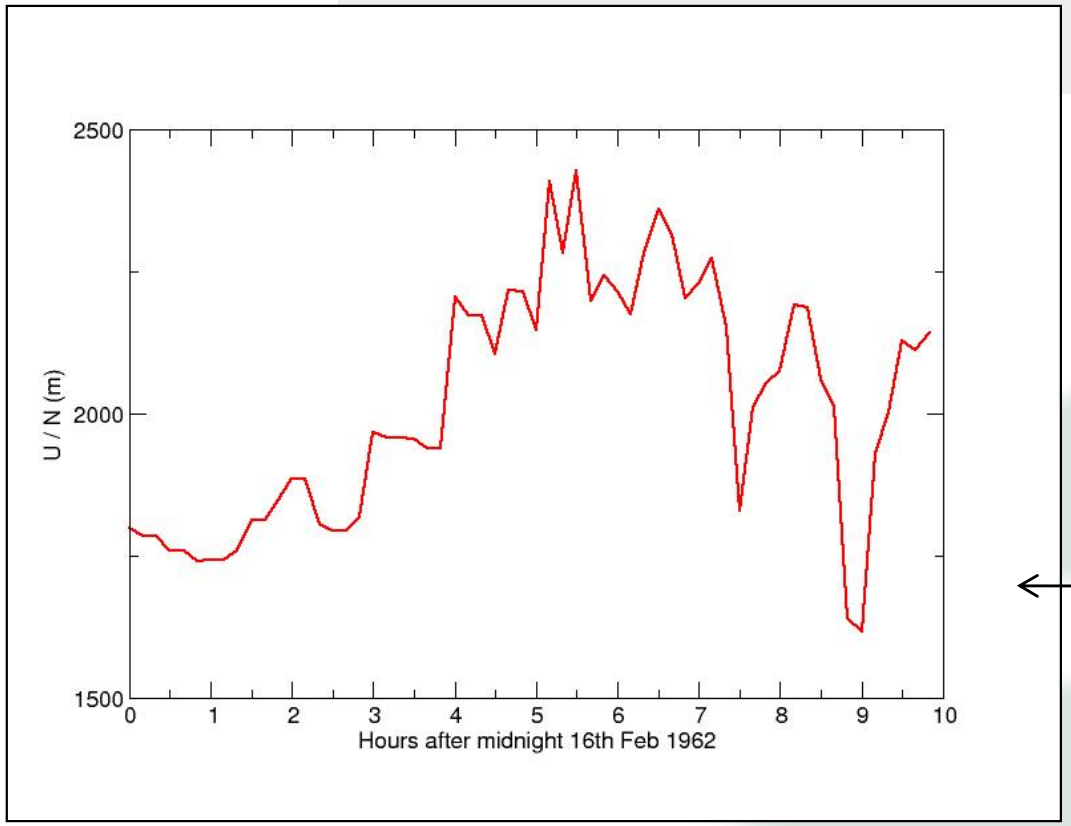


Resonance, rotors, flow separation, etc,

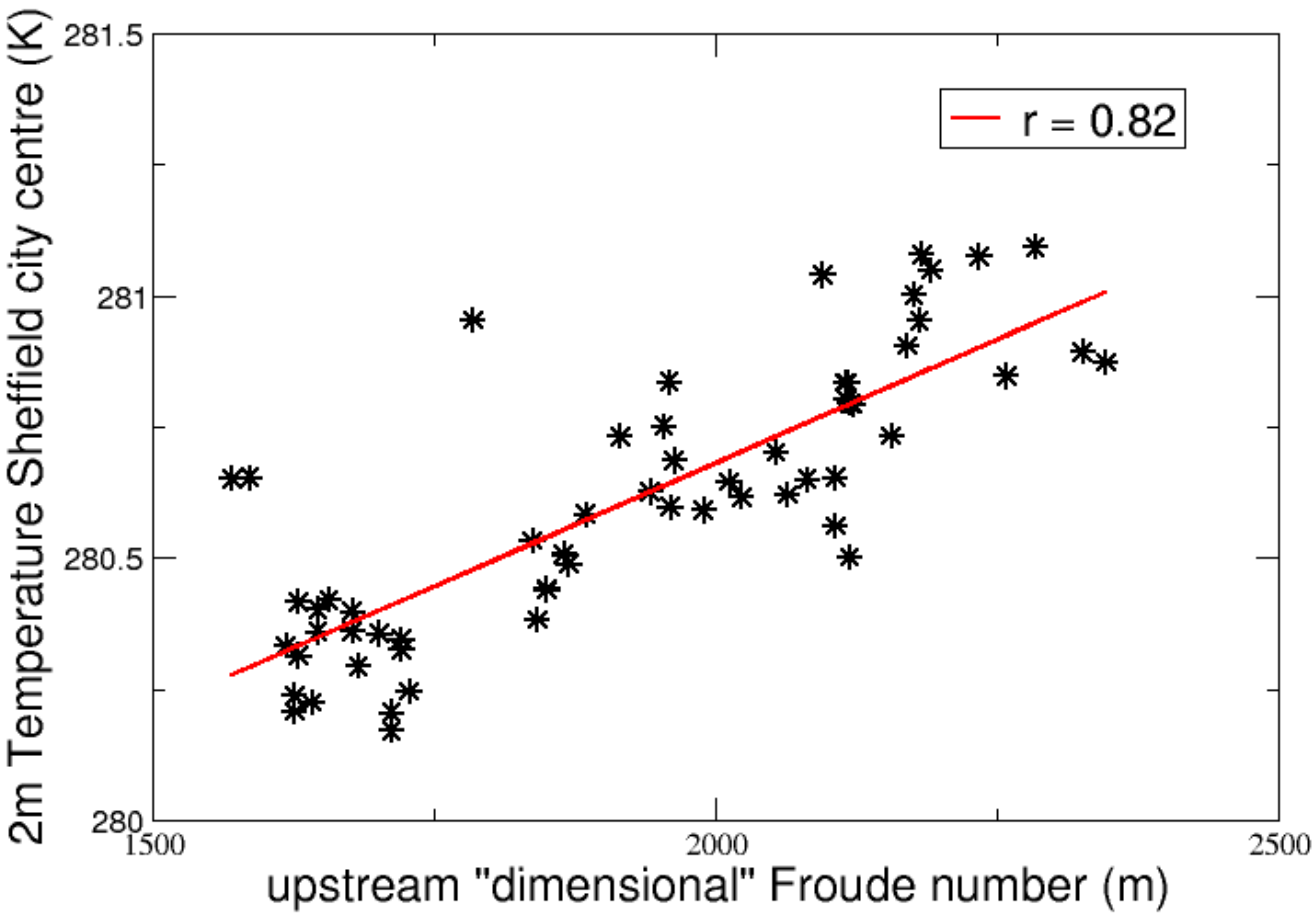
Erosion of cold air layer: YES



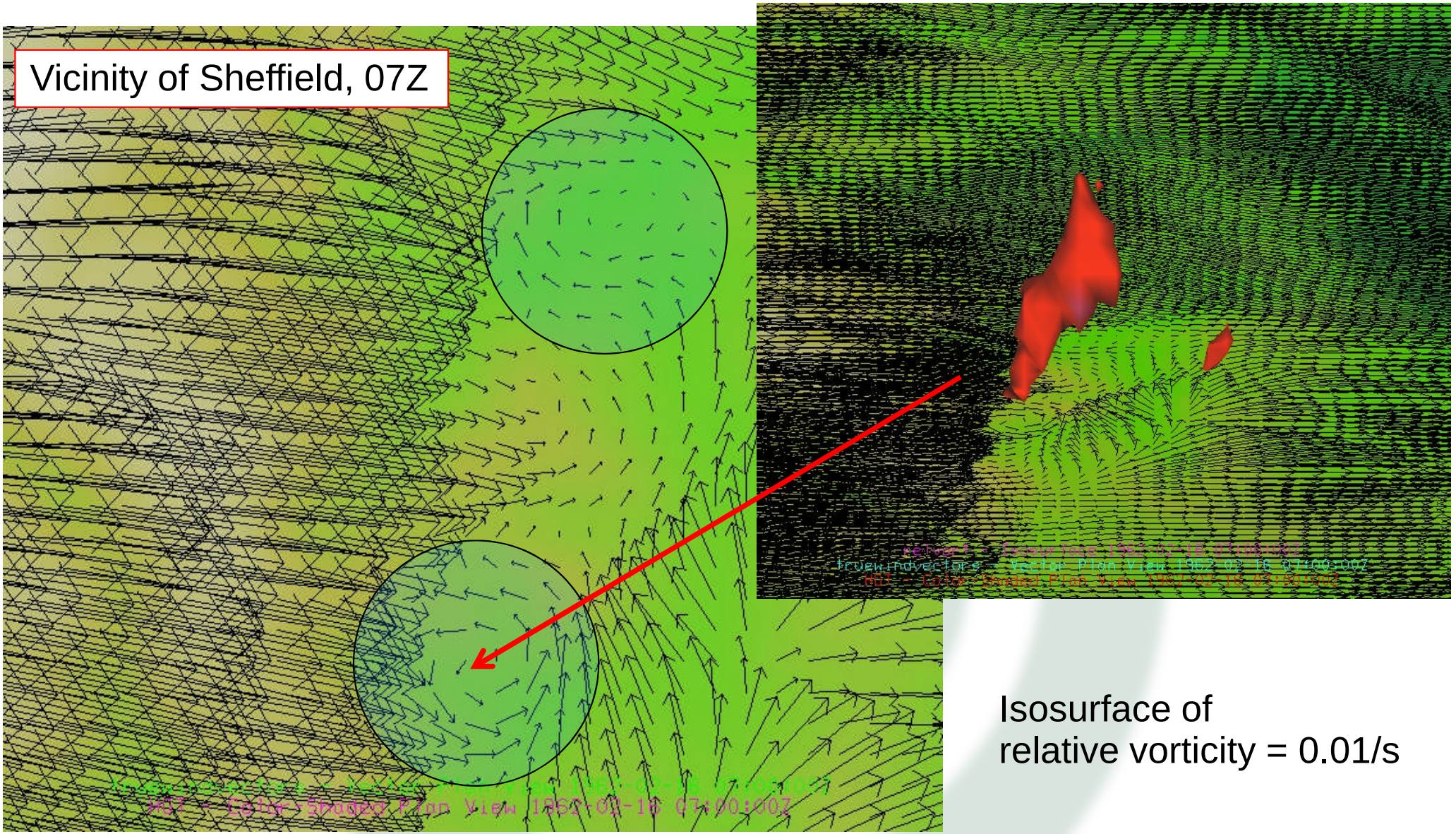
2m temps, Sheffield



"Froude" number
(upstream – Irish Sea)



The greater the upstream flow parameter (increasing *x*-axis: increasing nonlinearity of downstream response),
the warmer the surface (increasing *y*-axis)



Isosurface of
relative vorticity = 0.01/s

Not just the mean winds which do the damage: horizontal wind shear and vortices

Summary of initial findings

- Model simulates “extreme” response:
- Severe winds at surface
- Complex wave response (changes in wavelength, amplitude)
- Breaking waves aloft, very turbulent episodes
- Horizontal vortices at leading edge of wind storm (can be very damaging)

Model results and interview with Stephen Mobbs to be shown on *Inside Out*, BBC2, probably September

Return time of such storm episodes

- Considerable damage caused by gales in Sheffield in 1896, 1956, Feb 2nd 1962

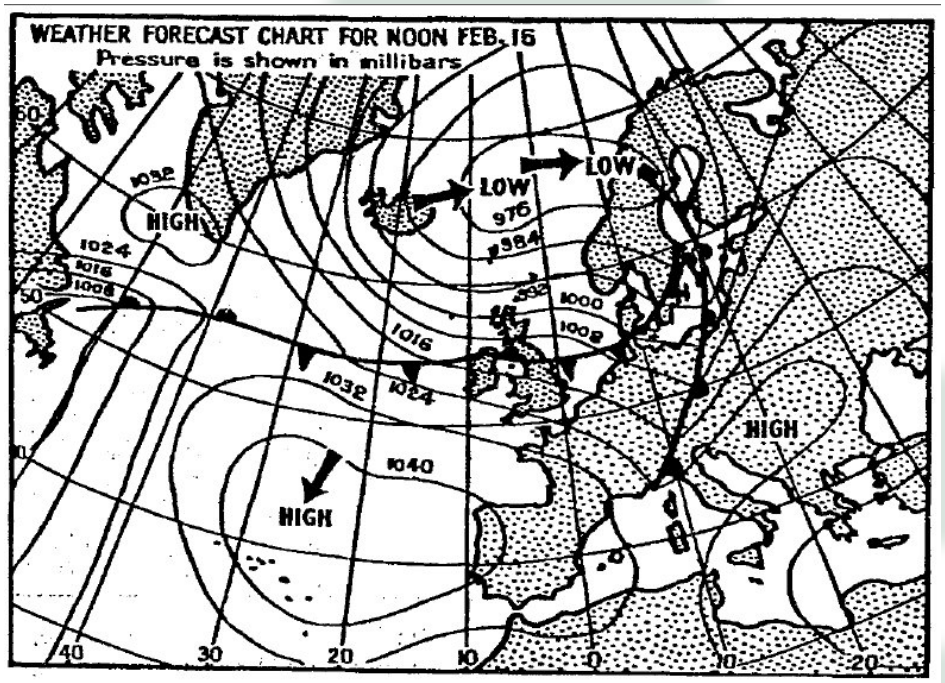
- Aanensen and Sawyer in (*Nature*) report that the Feb. 16th 1962 storm fits into the “once in 150 years” category.

- No anemograph traces for Sheffield and region before 1958

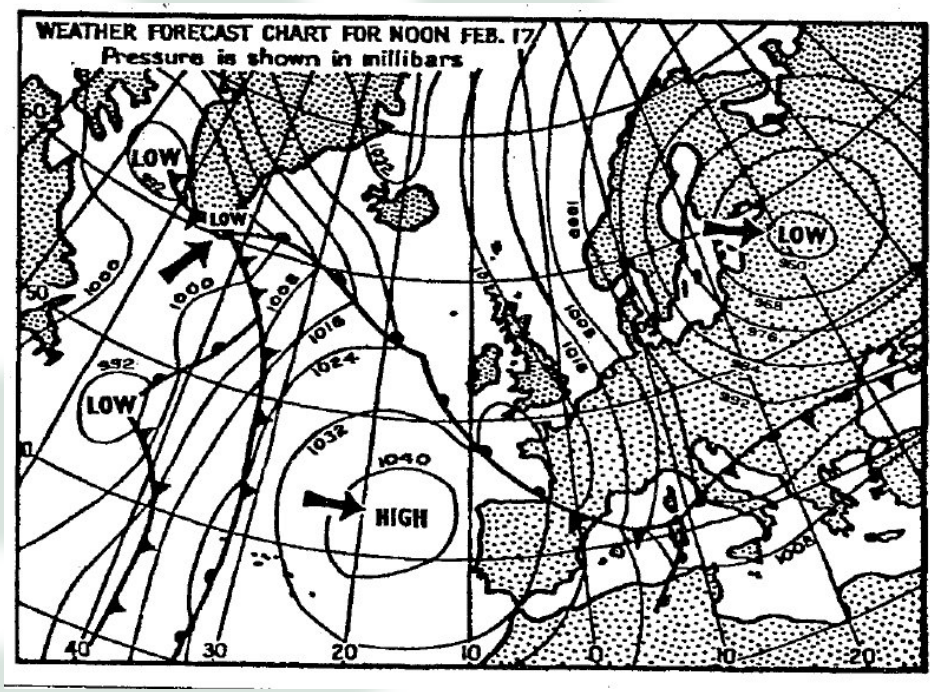
- Difficult to assess – but likely to happen again

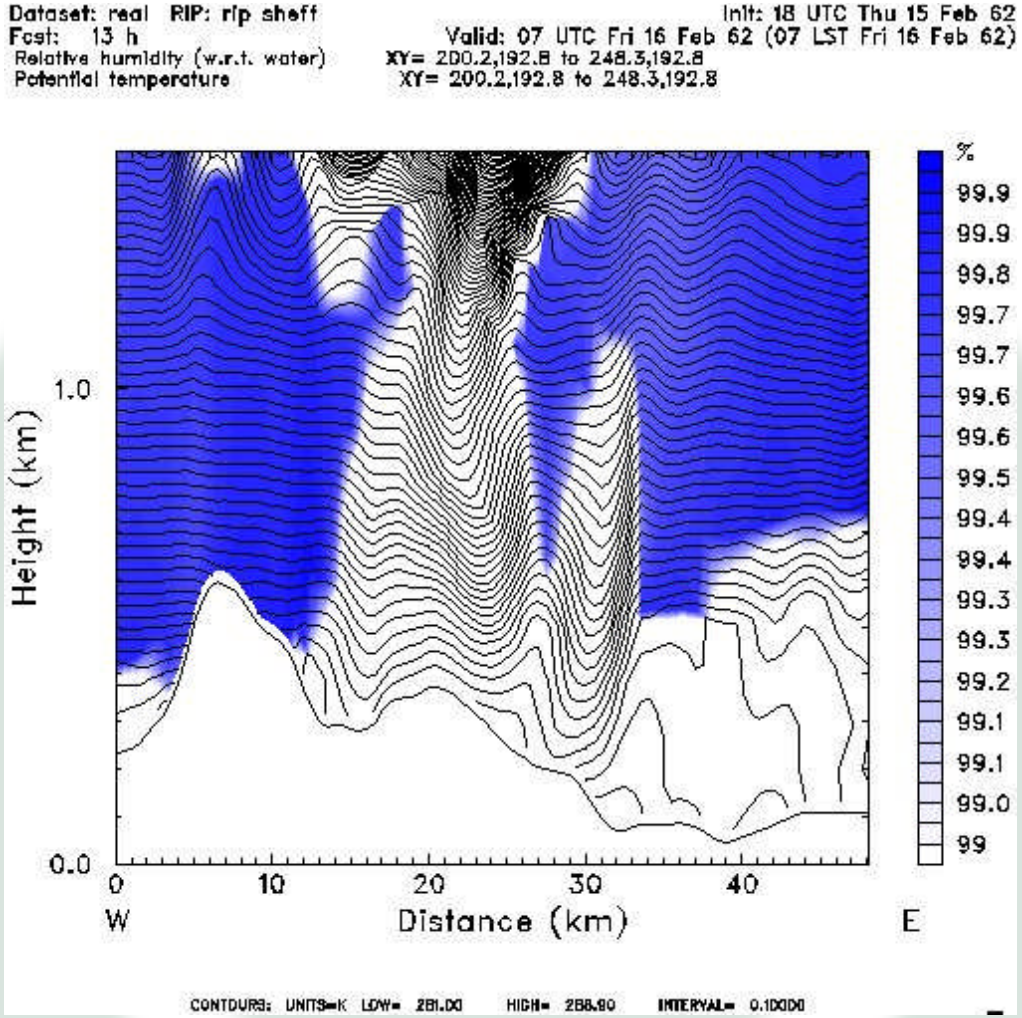
Synoptic situation (as reported in *The Times* at the time)

Feb. 16th

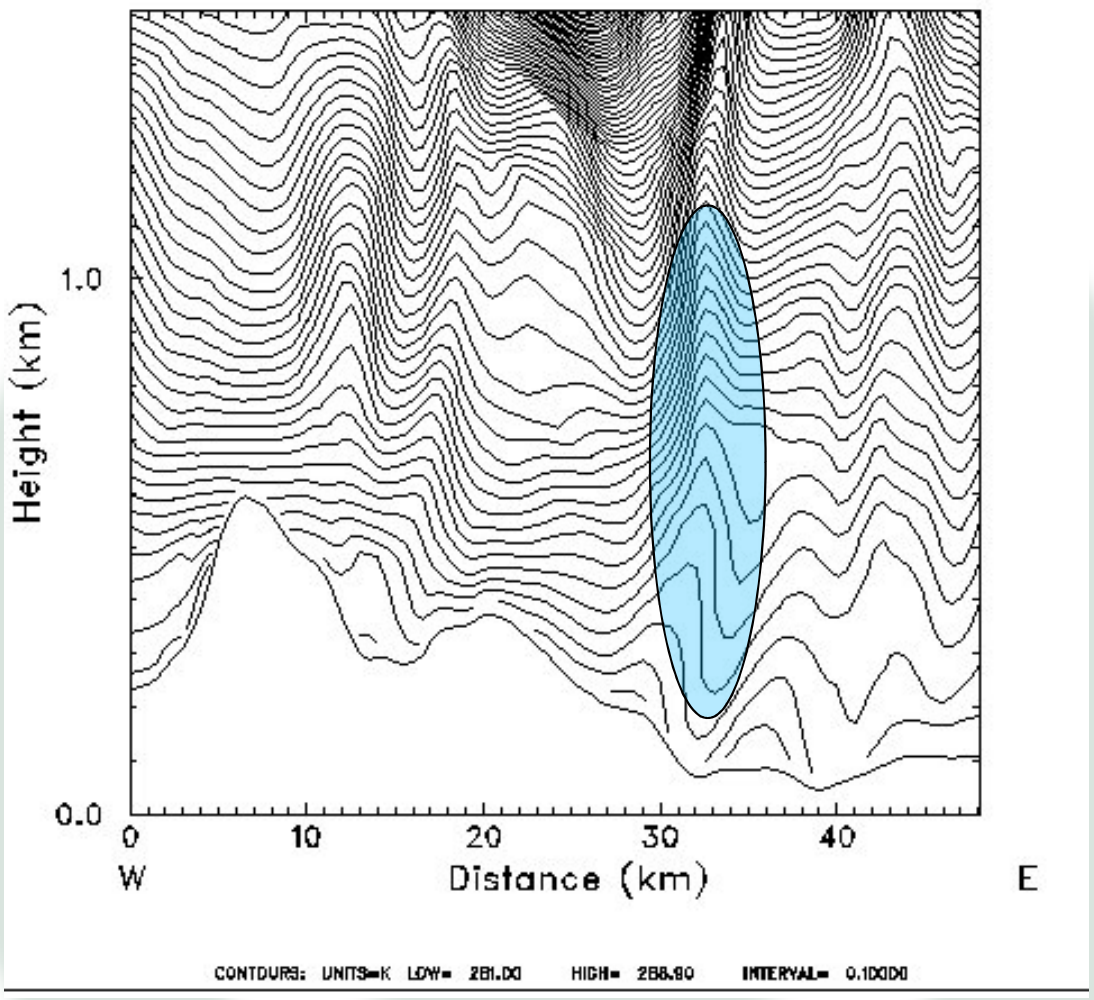


Feb 17th

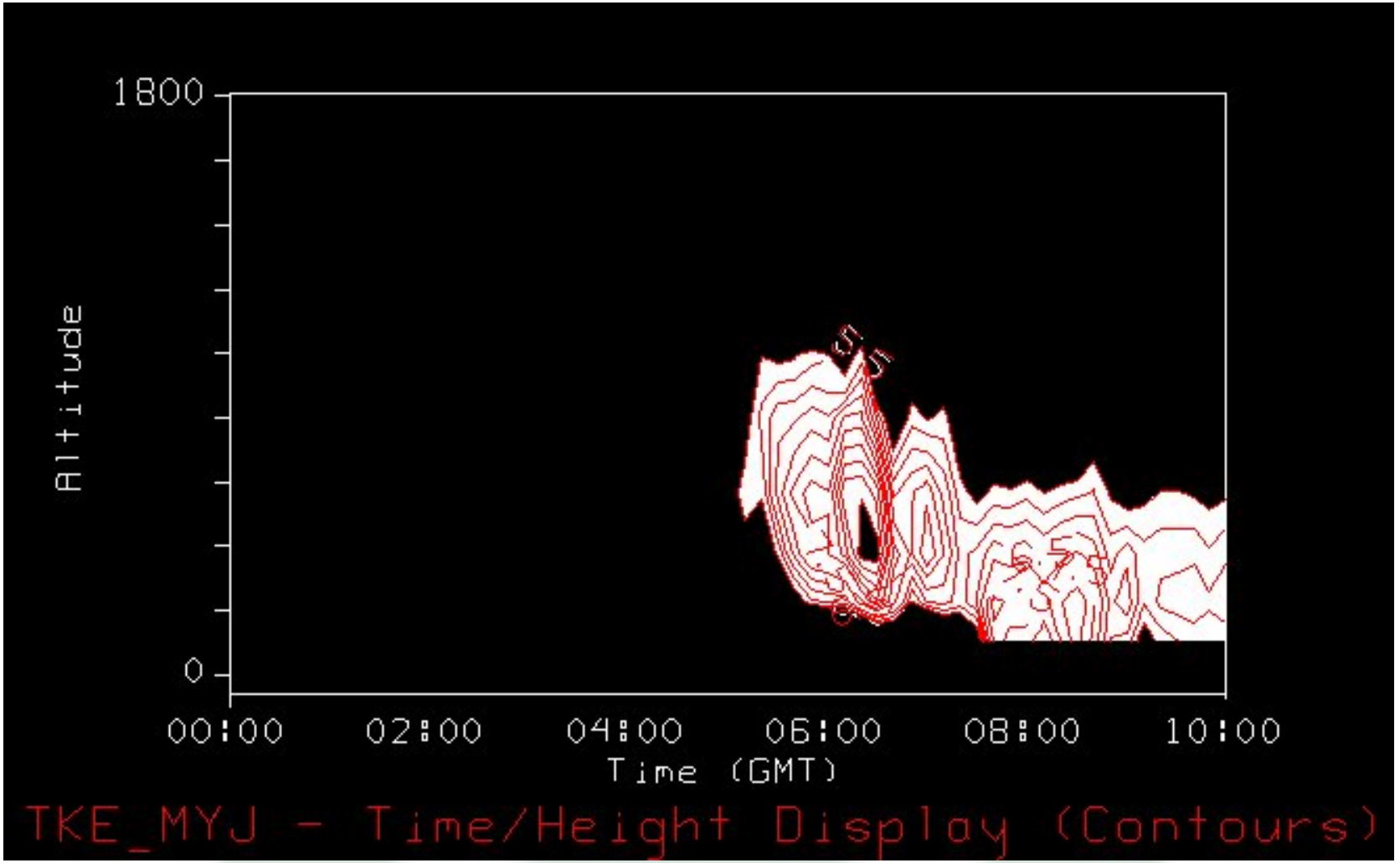




Wall cloud over Sheffield, 0720

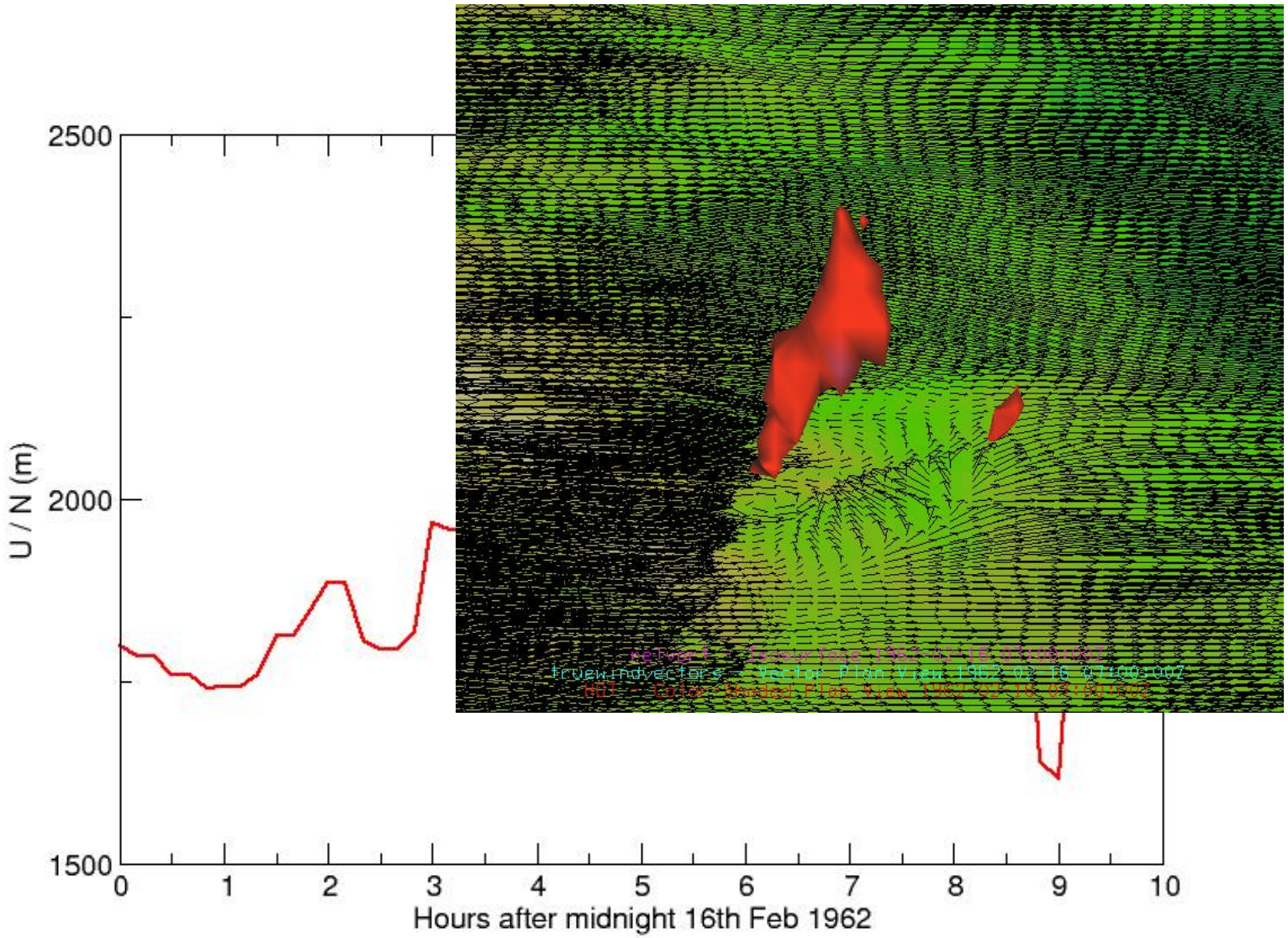


Breaking waves over Sheffield, 0710Z



Time-height profile of TKE, 16th Feb. 1962

Location: Sheffield city centre



‘Dimensional’ Froude number, before normalisation

Vertical velocities animation