

A discussion of the synoptic background and development of the the 7th/8th Jan storm

by PJ Blight

During Thursday 6th January 2005 an active conveyor belt system lay associated with frontal system across the North. Heavy orographic rain had been fairly stationary during the day across Highland and Argyll - perhaps over 50mm fell in some higher locations.

However to the west of Ireland problems were developing that were going to cause forecasters major headaches.

Models had been oscillating over the previous few days seemingly unable to decide whether to bring an active or flat wave NE across the UK overnight into Saturday. On the 5/6th Jan there was good agreement from the operational suite of NWP models for a fairly minor flat wave to run NE. However a few of the Ensemble members preferred a deeper development. As Thursday progressed this solution seemed to be gaining support from the rest of the operational runs.

Thursdays 12Z GFS, UKMO & French ARPEGE models all supported a much more active wave running NE across N Ireland, Scotland and towards Norway. The 12Z GFS was the most intense and took the low down to around 951mbs by midday on the 8th (as it turned out, not too far from the truth)

A study of the upper air dynamics of the Atlantic revealed a very complicated and highly sensitive upper pattern that was prone to errors and very difficult to forecast from.

At 12Z on the 6th a minor shortwave was moving SE across the N Atlantic having emanated from the eastern seaboard of the USA earlier in the day. This shortwave supported a jet streak on its SW flank and a large area of PVA on its ascending flank. It appears that the shortwave caught up with the elongated trough, creating a rather larger & sharper upper trough to the west of Ireland. The jet streak (circa 120knts) rounded the base of the upper trough during the day on the 7th (water vapour Loops confirm this). This happened at the same time as a wave on the existing cold front was moving NE to the SW of Ireland. The wave interacted with the PVA and a low pressure development was initiated and subsequent pressure falls began. Throughout the rest of the day on the 7th the development moved NE, this time under the left exit of the developing jet over Ireland and more rapid deepening ensued. The jet strengthened across the UK overnight (to around 150Knts) and the downstream trough amplified, becoming markedly confluent on its rear side. The low by this time was deepening explosively under the diffluence aloft.

Fig 1 (see below) shows the WV image at 12Z on the 7th, the jet streak had just rounded the base of the upper trough and was about to engage the cold front wave. All ingredients appeared in place including a sharp thermal contrast across the NE Atlantic.

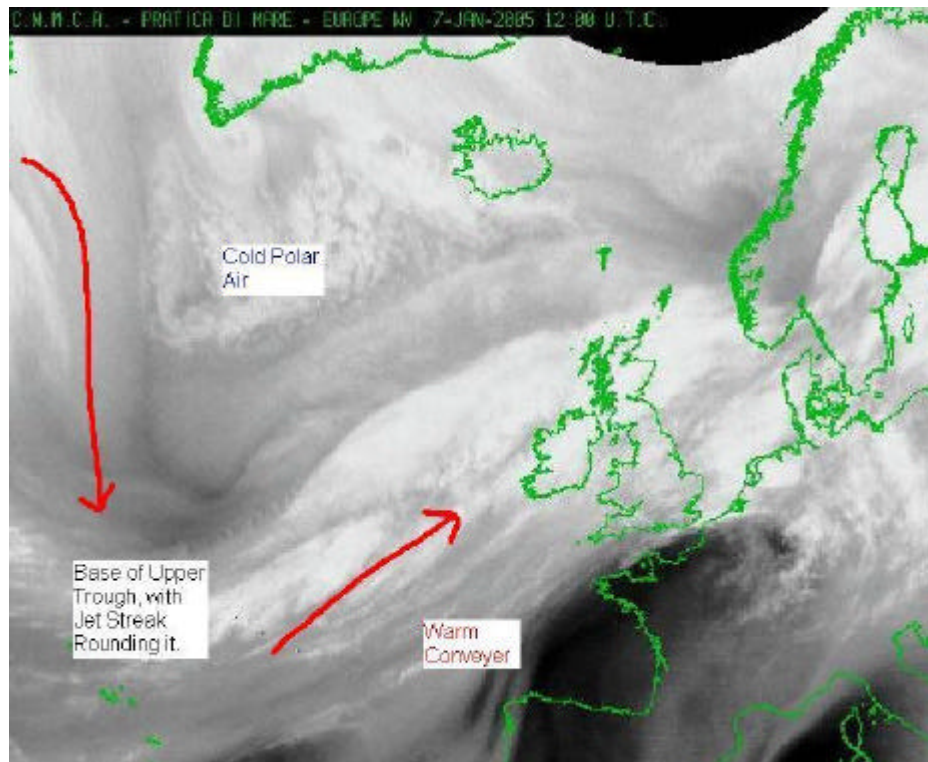


Fig.1

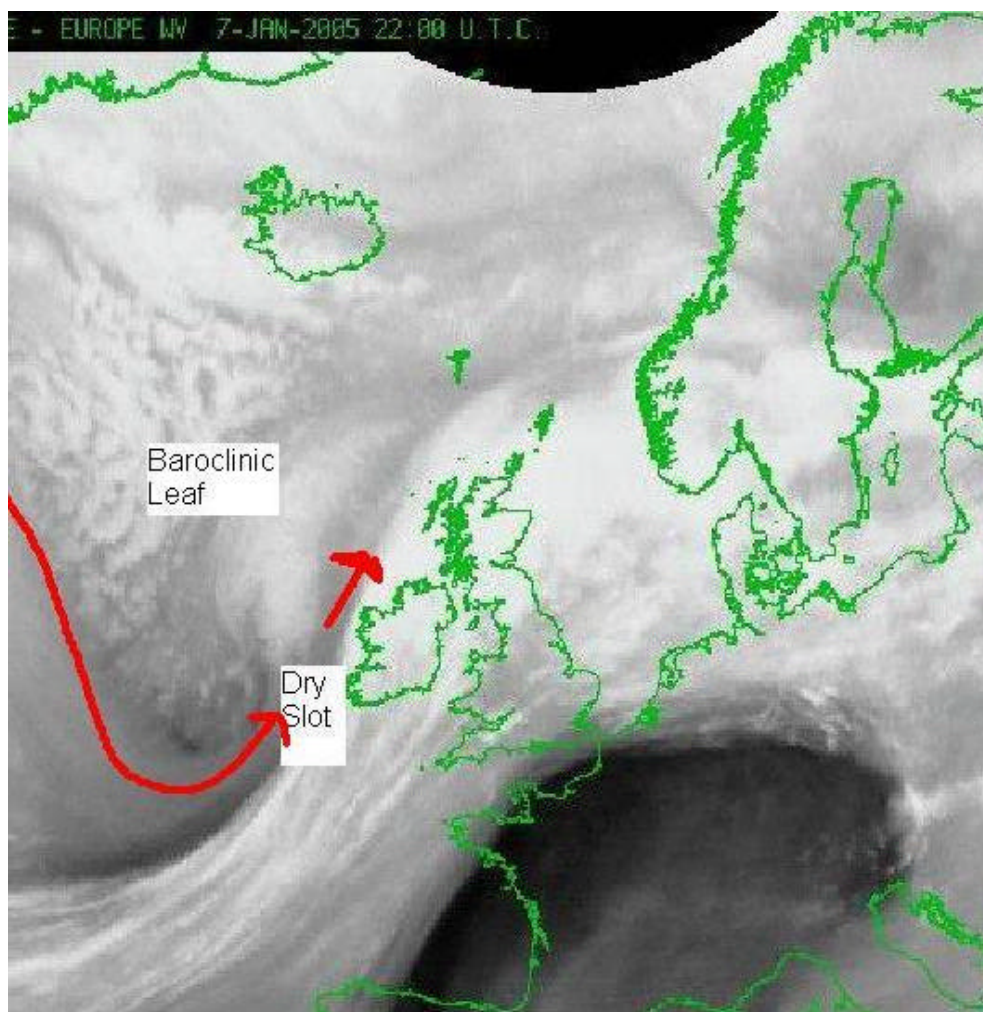


Fig.2

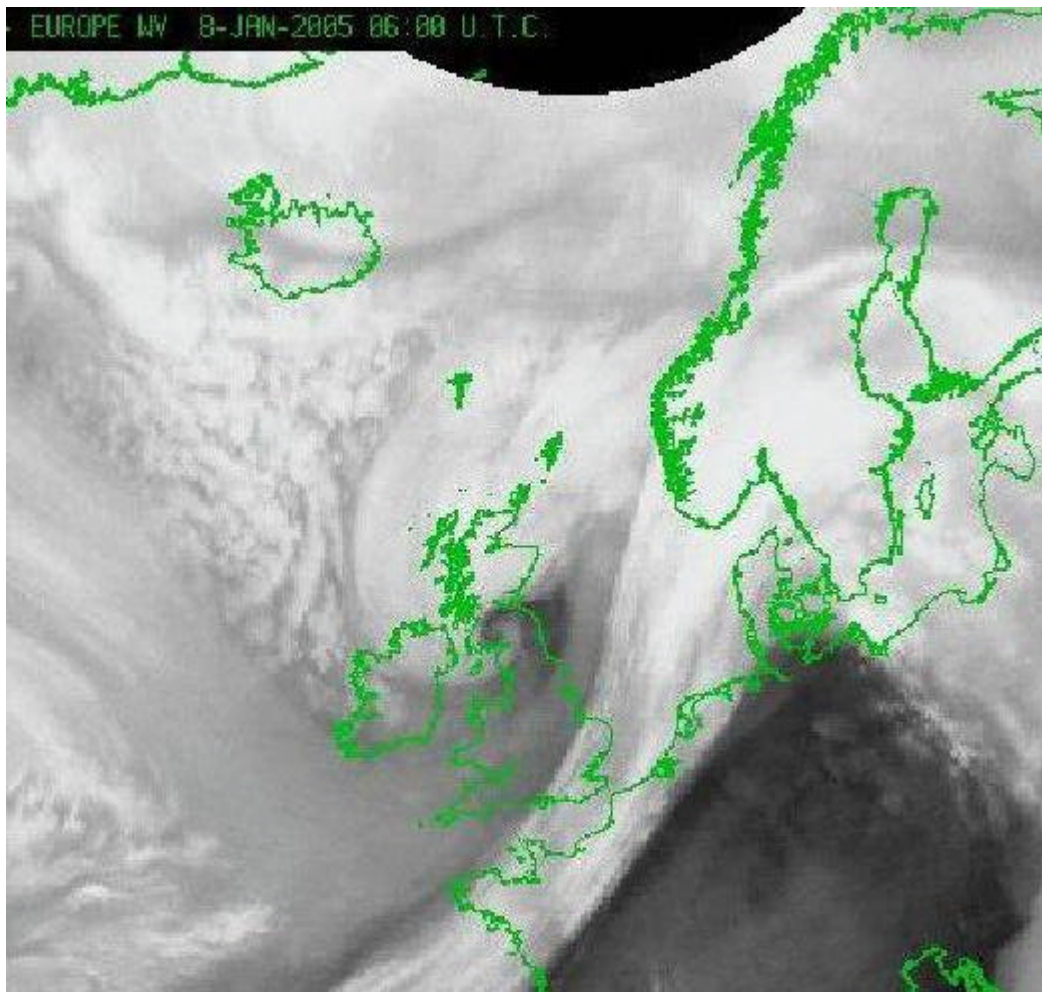


Fig.3

During the evening of the 7th the low was developing pretty much as expected. Pressure falls in the 6-7mb /3hrs were occurring over Ireland, and the centre appeared to be off Belmullet at 21Z at around 988mbs. Overnight it tracked across N Ireland and into S Scotland (along the southern side of possible projection paths) whilst increasing pressure falls were being reported over eastern parts and into the N Sea.

Fig 2 (above) shows the WV Image at 22Z on the 7th, by this time marked cyclogenesis was underway, the dry slot and attendant baroclinic leaf showing up in a "classic" shape- they don't come much better than that with only a few similar occasions over the past ten years seeing such excellent baroclinic leaf and dry slot presentations. The marked dry intrusion and cooling cloud tops on the baroclinic leaf indicated marked cyclogenesis was underway with the colder polar airmass beginning to wrap around the depression's western flank.

Fig 3 (above) shows the WV image at 06Z on the 8th, the classic swirl of cloud leading into the depression centre over the Borders. The back bent occlusion by this time coming across the Irish Sea into Cumbria with gusts to over 100mph.

A plotted 06Z (on the 8th) analysis showed a rather elongated low centre stretching from nr NE Scotland (where there appears to be a COG) to off the coast of Berwick upon Tweed, where another centre appeared, both at around 968mbs. This elongation of the centre resulted in an exceptionally strong pressure gradient through the North Channel, across N England with the strongest gusts in the strong post occlusion flow.

A gust at the exposed St Bees Head appears to be at the extreme end of the scale (over 100mph), but does give an powerful indication of the gradient wind being dragged right down to the surface in a typical sting jet scenario. Gusts elsewhere topped 70-80mph even at low level land sites.

By 12Z on the 8th the deep depression was sat off SW Norway and had dropped to sub 960mbs - Prob around 957mbs, Models were having difficulty coping with the deepening and were generally a few hrs constantly behind when it comes to its depth. Maximum depth end up close to 950-954mbs.

WV loops still showed marked forcing associated with the feature with dry upper tropespheric air extending down to the the surface, ensuring very strong gusts to the SW of the back bent occlusion.

Huge pressure rises ocured during the morning over N England and Southern Scotland in the strong confluence behind the upper trough (nr 20mbs in 3 hrs - which is not common). Dunfalin reported a rise of 19.3mb in the 3 hours up to 10Z, probably giving a return rate of at least 50 years.

The strongest winds were now out over the North Sea, Oil platforms reporting gusts to over 100mph and mean winds over Hurricane force 12 strength, Denmark was starting to feel the storms influence and gusts to 80-100mph developed a few hrs later. The storm then spread its fury across the Baltic, before being progged to slowly fill over the Baltic States on the 9th.

An excellent job of forecasting the storm was carried out by the GFS model on Tuesday the 5th on the 18Z cycle. The model was more accurate on that one run than ANY of the subsequent runs throughout the whole of Wednesday. From 00Z on Thursday all models produced some excellent results, but once again the UKMO Global Model and the GFS were at the top of their peer groups in producing an excellent forecast. Credit must also go to the UK Met Office at Exeter for timely warnings and a pretty accurate track and depth of the low.

The 7/8th Jan Storm was certainly a very fierce winter storm, developing from a shallow wave on a cold front to a 'monster storm' in about 18hrs. A highly developmental North Atlantic upper pattern produced some explosive cyclongenesis and some of the strongest winds over the UK for a few years. Unfortunately related damage and destruction is the legacy both in the UK and for our European neighbours.