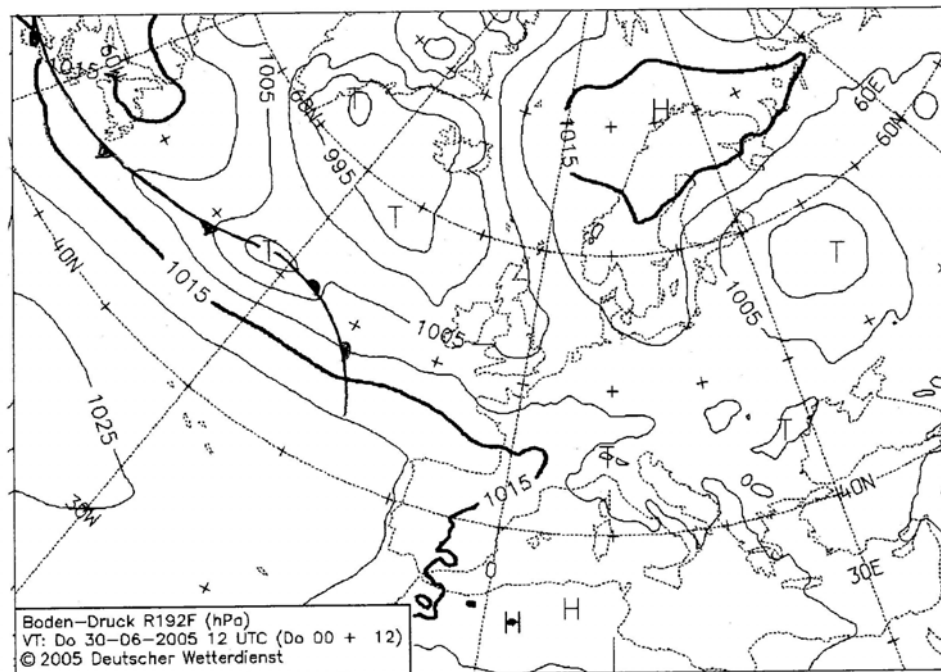
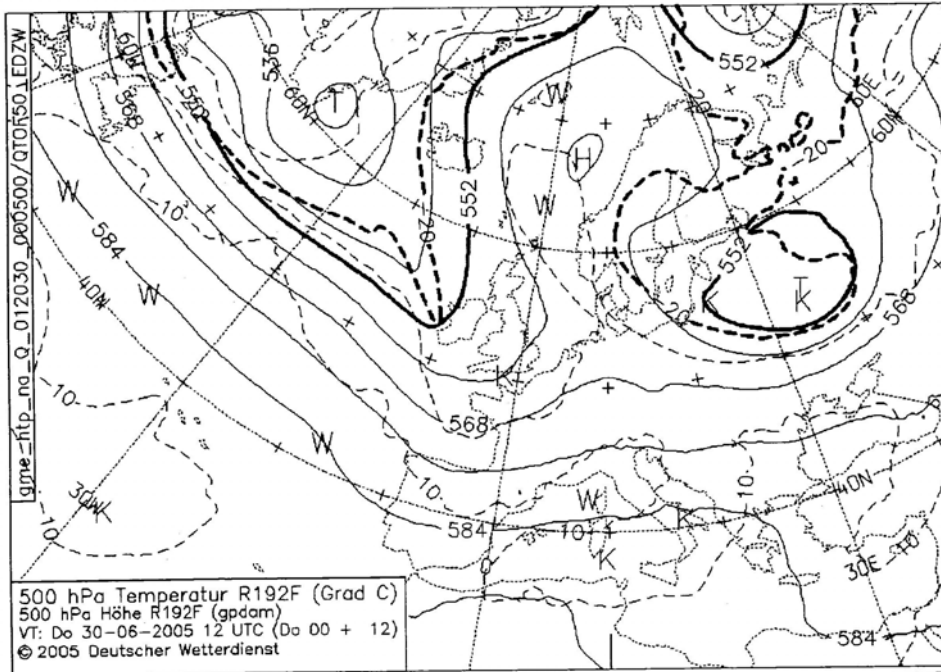


An Example of Synoptic Diagnosis

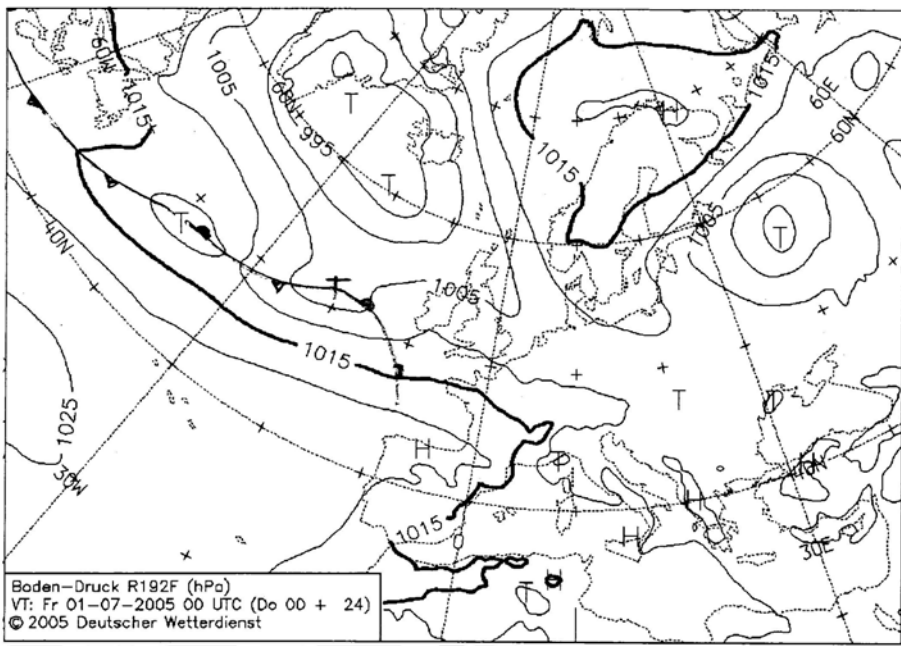
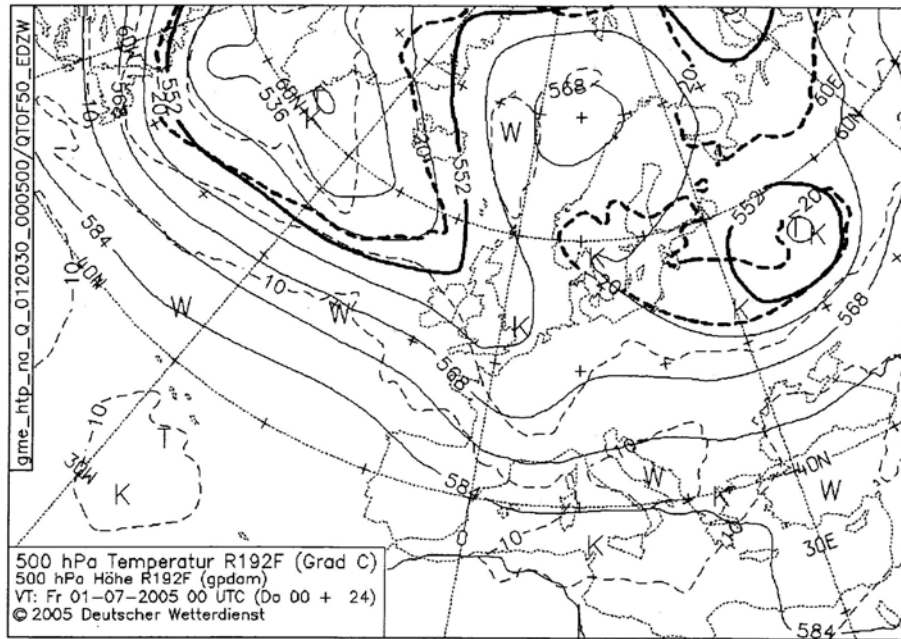
- using model forecasts in order
to understand the simulated
development

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The surface map shows a young cyclone west of Ireland with well defined fronts and a wide open warm sector. According to the direction of the isobars in the warm sector it will surely move east-north-eastwards. But will it deepen in doing so – following the typical life cycle of cyclones over the north Atlantic ?

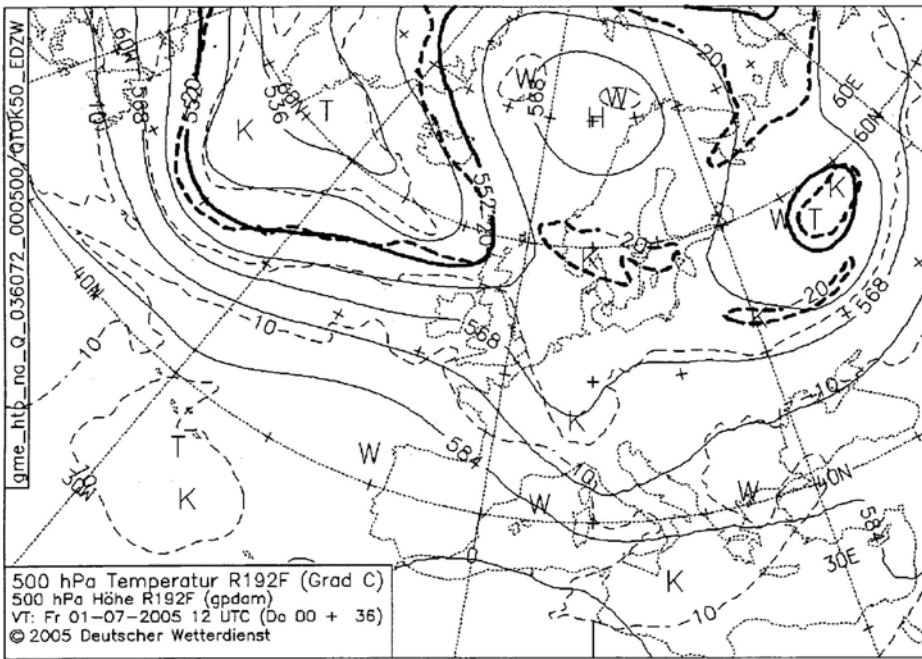
This question cannot be answered with the aid of the surface map alone. The comparison with 500 hPa shows a nearly straight current above the surface low and no distinct trough behind it which would be necessary for a deepening due to the effect of upper PVA. Therefore the low has to be classified as a baroclinically stable wave which will be displaced by the effects of WA and CA, but will not deepen.



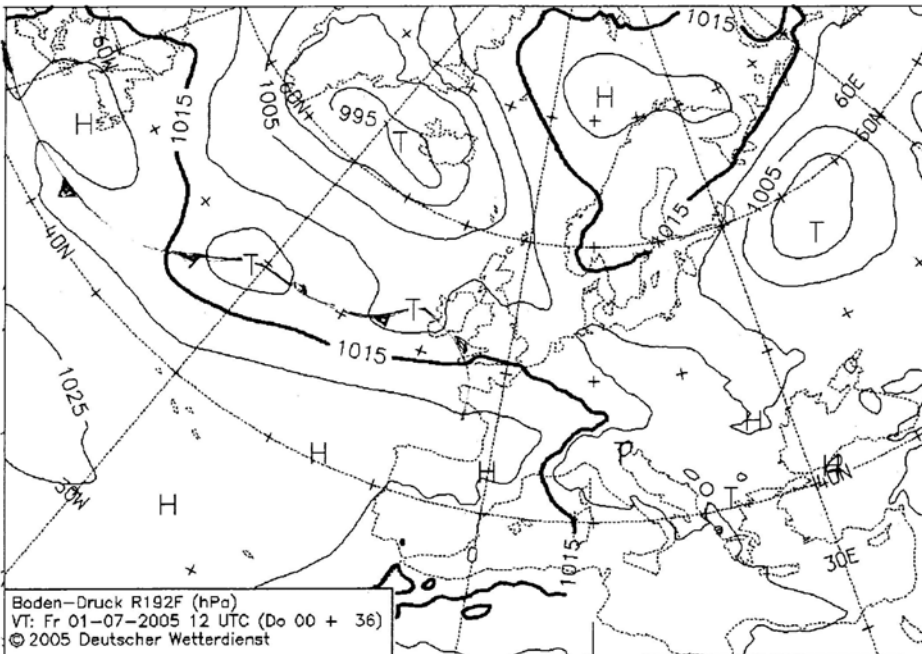
The forecast for the date 12 hours later indeed shows the low displaced in easterly direction, but not intensified. The central pressure has even slightly increased. In addition, a wave at the cold front is predicted – possibly as result of the frontogenesis which was effective at the front.

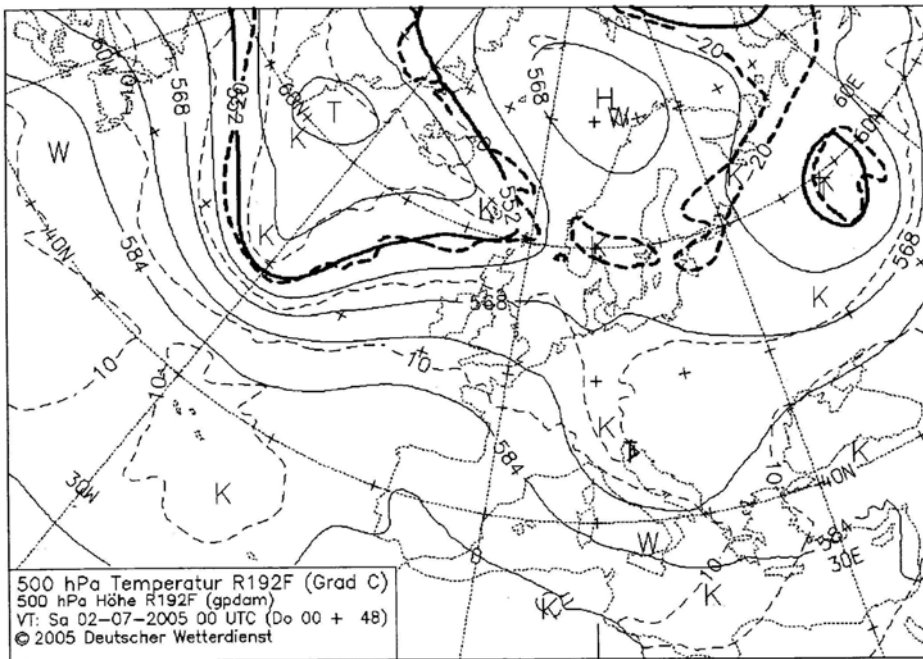
Asking again for the future development, It has to be stated that the conditions aloft did not change. There is still a nearly straight current at 500 hPa above the centre of the low as well as above the wave at the cold front. Both features should therefore move further eastwards without deepening.

But the upper current now contains a significant trough above Newfoundland and southern Labrador, i.e. behind the wave at the cold front. If this trough moves faster than the wave, a deepening of the wave can be expected – according to the PETERSSEN scheme of cyclogenesis.

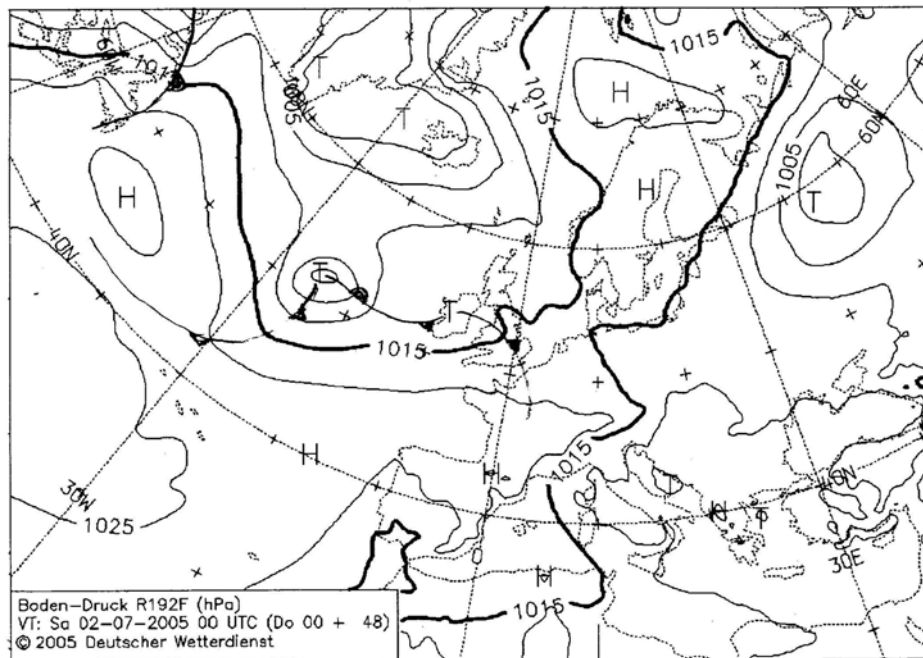


The forecasts for 12 hours later indeed reflect an approach of the upper trough to the lower wave which already shows some intensification. Both features now represent a typical baroclinically unstable wave with a backward tilt of the trough axis in the vertical. The ascent due to the upper PVA therefore becomes effective directly above the lower wave so that the convergence below the level of strongest ascent leads to an increase of the vorticity of the wave. On the other hand, the CA behind the lower cold front works below the upper trough and causes descending motion there leading to upper convergence and intensification of the vorticity of the trough. The primary low, however, will remain stable and move further eastwards – following the WA with its cyclogenetic effect for the lower layer.

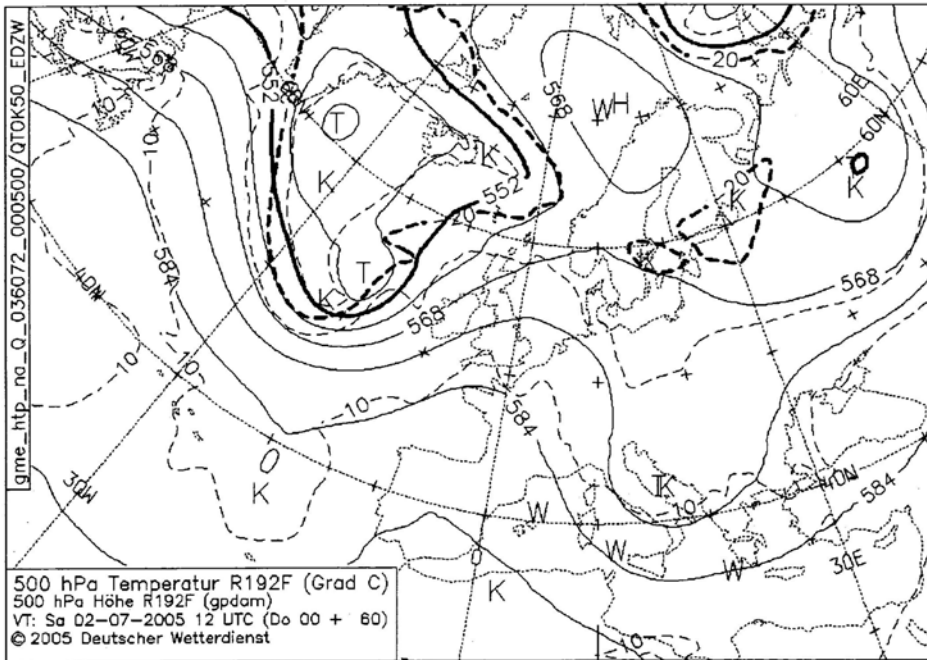




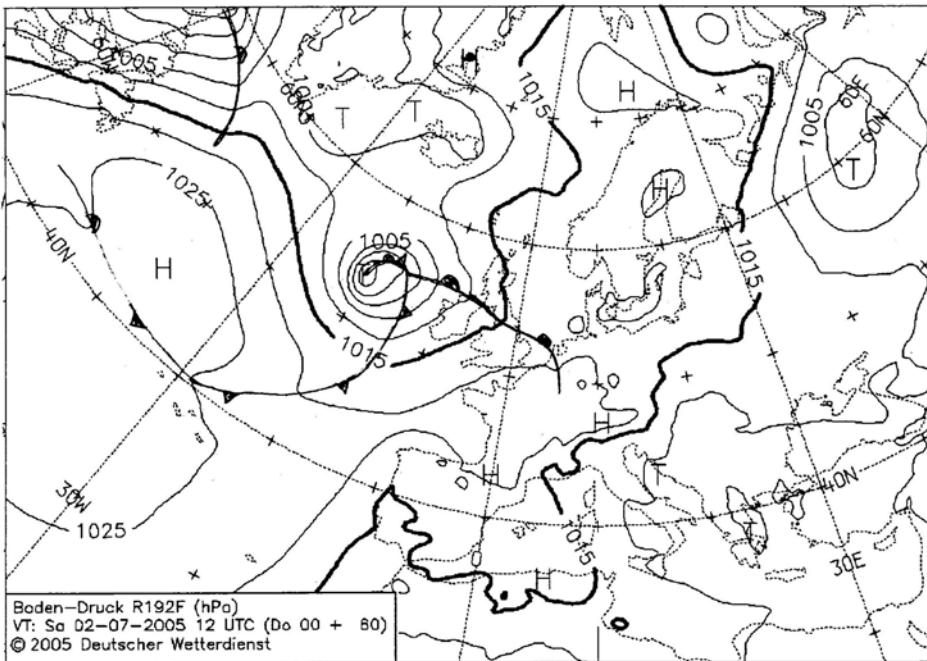
The cyclogenesis at the wave is well underway. The central pressure has lowered by 10 hPa and the pressure gradient around the centre has strongly increased reflecting the increase of vorticity. On the other hand, the upper trough has sharpened and extended to the south. Since the surface low has a position well ahead of the trough, the process of intensification at all levels will continue.



Due to the WA ahead of the low there is an geopotential rise in upper levels downstream of it. Together with the deepening of the trough that leads to a backing of the upper current above the low. The upper geopotential rise also leads to a further weakening of the first low which now appears only as a wave at the warm front of the developing cyclone.



The forecasts for 12 hours later show the mature stage of the cyclogenesis with a further deepened surface low lying excentrically at the rear of the whole cyclonic system and the beginning of the occlusion process of the fronts of the cyclone. Also for 500 hPa a closed low is now predicted slightly ahead of the whole upper trough, but directly above the surface low. That means, however, that the vertical axis of the cyclone is now upright, and no significant further deepening can be expected.



In connection with the built-up of an upper ridge downstream of the cyclone the first low has now fully lost its independence and is absorbed into the circulation of the new cyclone.