Appendix 7: a SAR detected pollution spot

On June 2 2009 at 8h16, a possible pollution spot was detected near 30°30.5'W 2°43.4N by the synthetic aperture radar (SAR) on board the COSMO SkyMed 1 satellite. Figure A7_1 below shows the cusp shaped spot detected, which does not have the characteristic elongated form of an oil spill coming from a ship. CLS and CEDRE experts were not able to understand its origin. Report by G. Hajduch, P. Lozach & F. Collard gives other SAR images with well-identified signatures from ship tracks and oil spills.

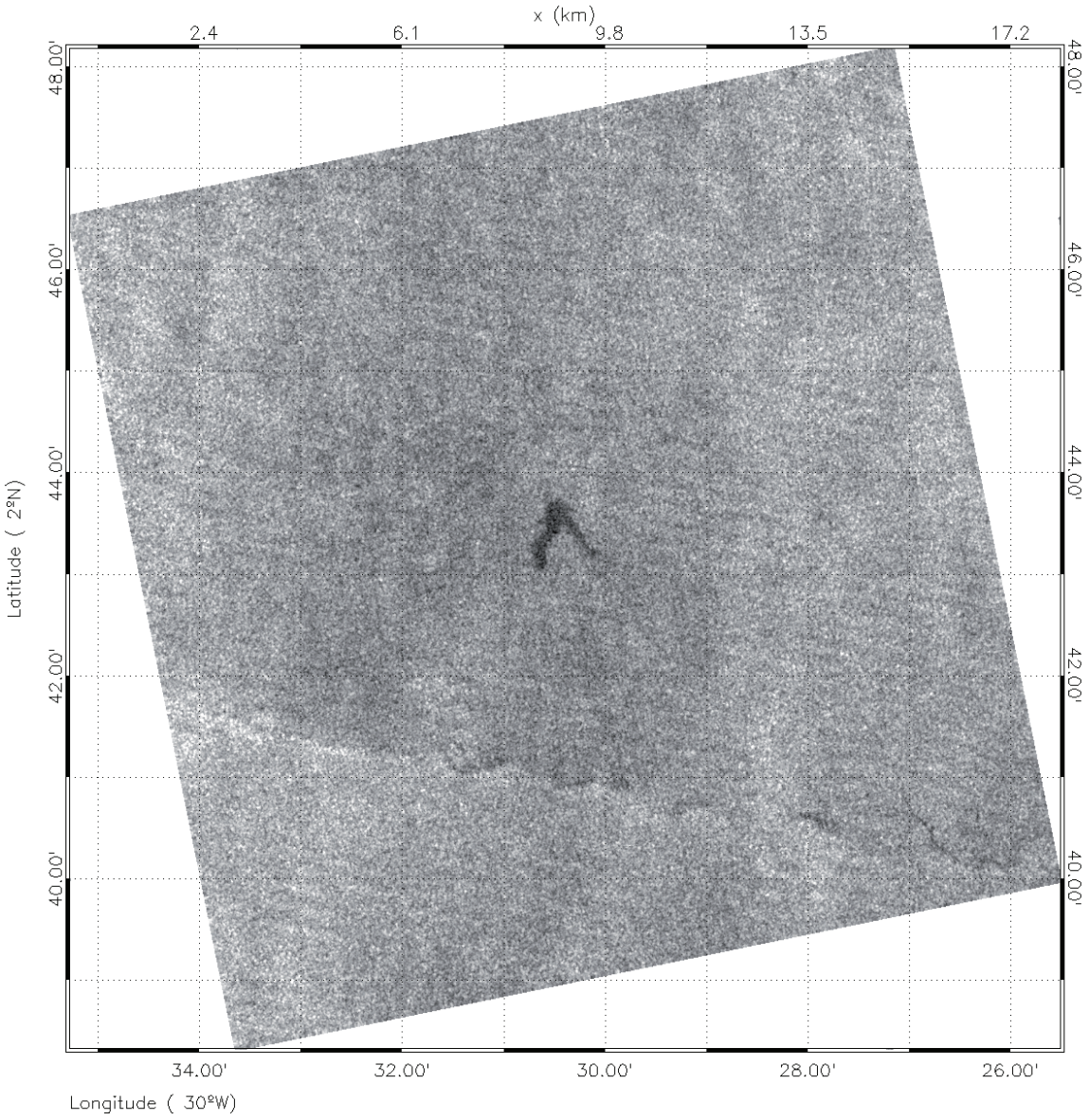

Figure A7_1 Cusp-shaped pollution spot seen on a COSMO SkyMed SAR image (on June 2 2009 at 8h16). A 330 m wavelength swell (propagating southward) is also visible (the SAR resolution is 30 m).

We have seen in chapter II (section on particle trajectories), that the back track (to June 1 at 2h15) of this pollution spot falls (within one or two kilometres) under the plane flight line roughly 10 nautical miles south southwest of LKP (one minute of flight time). This prompted us to check if such a spot could correspond to some kerosene (aviation fuel) released by the plane.

Within a few minutes after release, kerosene spreads on the sea surface as a very thin layer of the order of 1 μm (actually between 0.05 and 5 μm; the uncertainty is large). After 30 hours kerosene will have evaporated and dispersed[26] almost completely: with an initial amount of 50 m^3 there would remain (with a 10 knots wind) roughly 0.5 m^3 for a SAR detection. The estimated area of the spot on Figure A7_1 is approximately 0.5 km^2 and that would correspond to a layer 1μm thick at most. Knowing that some 43 000 kg of kerosene were still in the plane tanks after its 3h 40 mn flight (Rio to LKP), thus roughly 54 m^3 (kerosene density is 0.8 kg dm^{-3}), it is not impossible that this pollution spot may be the remnant of a kerosene release by the plane (be it voluntary or not). Of course it is difficult to tell which quantity is precisely involved (it may vary between 3 m^3 and the whole 54 m^3).

A last point concerns the wind drag on the spot as a whole: generally, 3% to 4% of the wind speed is assumed for oil (CEDRE, 2004). On Figures 25 and 27 we took 0% and 2% respectively (kerosene is light and volatile and has possibly a smaller wind drag than oil). The greater the windage the nearer the back tracked position to LKP since winds were northerly, but the nearest to the plane track is obtained with a 2% wind drag (whence our choice). Over only 30h we could expect a small distance between positions estimated with a 1% drag difference: there is however a 5 km distance (slanted in a SW-NE direction, see Figure A5_2) because the wind was strong then.

We have been unable, however, to relate this pollution spot to any impact point of the plane as determined from the debris and bodies found and the velocity fields estimated (whatever the methods).

But, all our calculations, are based on the assumption that the plane hit the sea surface intact (following BEA expertise of the recovered plane remains).

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[26] breaking waves can drive small droplets into the water column. This process is called dispersion (Lehr & al., 2002)