

NAS software Limited
Incorporating InfoSAR

The use of satellite SAR to monitor agricultural land. Prof. Chris Oliver, CBE

It is often impossible to classify land use on the basis of an individual image due, for example, to poor resolution. However, classification may be possible based on exploiting the temporal fluctuations in the returns from different types of scene. This example discriminates between uncultivated (e.g. woodland or set-aside) and cultivated agricultural land using optimised joint segmentation and temporal texture detection on ERS imagery. It also demonstrates the ability to detect change in land use.

The results shown demonstrate that optimised temporal fluctuation detection (based on normalised log data) allows one to classify unchanging and changing land use areas. Not obvious (since the fixed filter results are not shown) but true: they demonstrate again that segmentation offers an optimised adaptive filter to identify the regions of constant RCS, and that the segmentation results are much better than can be obtained with a non-adaptive filter.

Original ERS images - 1992



July 14



Sept 22

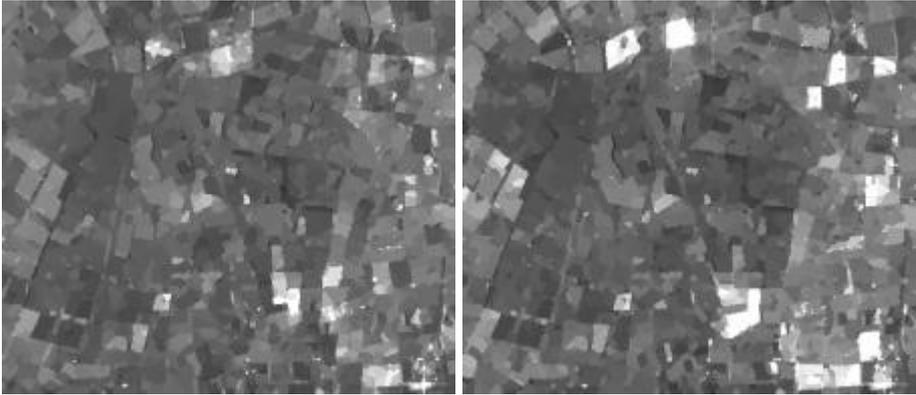


Jan 5



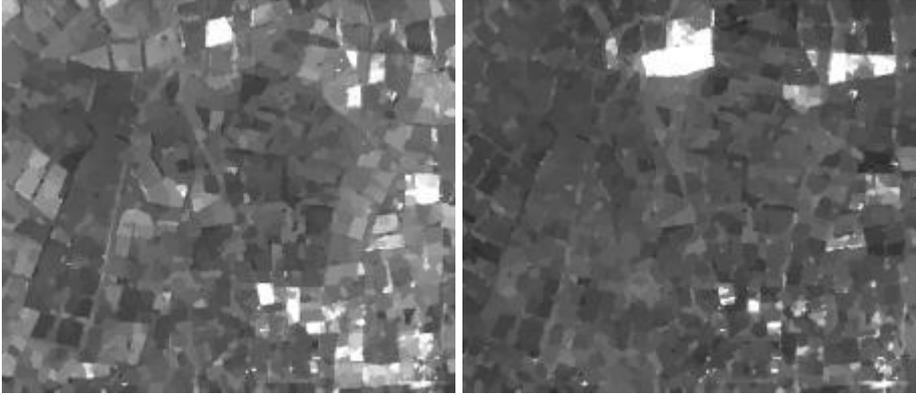
March 16

Joint segmentation - 1992



July 14

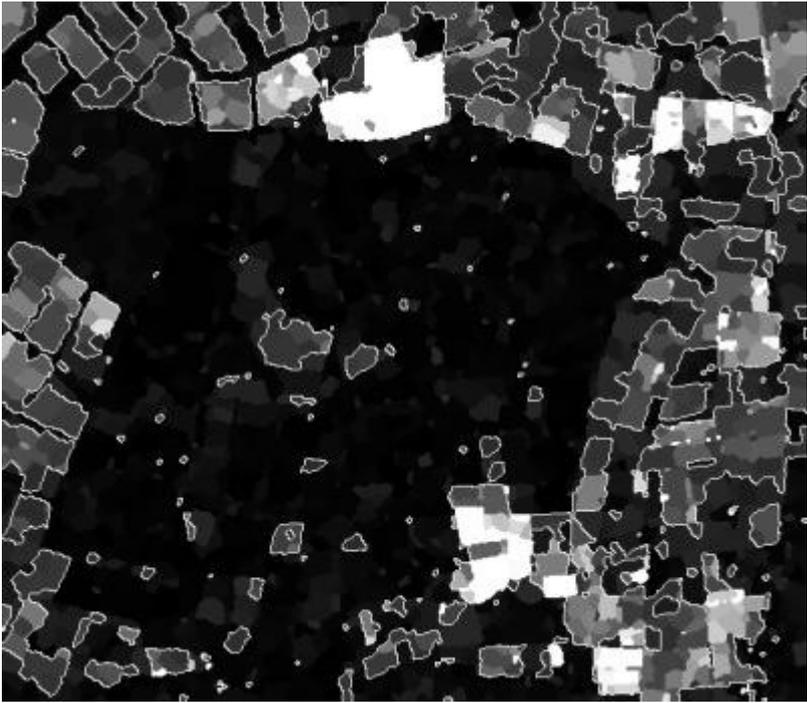
Sept 22



Jan 5

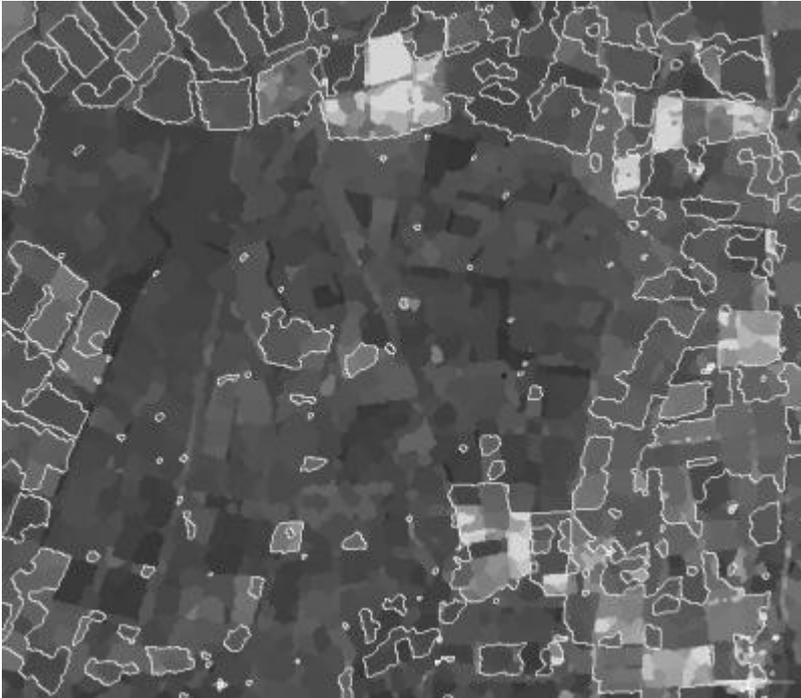
March 16

Normalised log classification - 1992



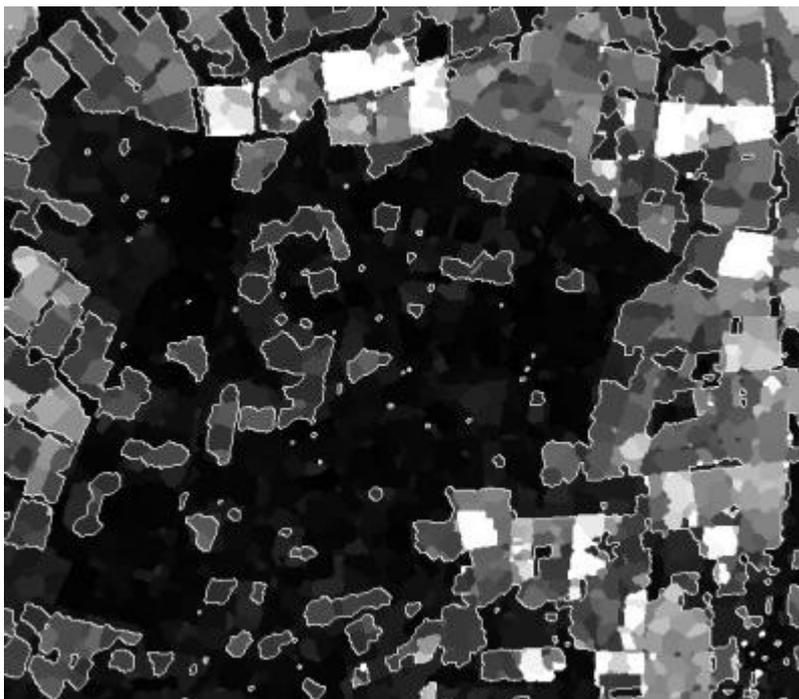
The Maximum Likelihood estimator for detecting temporal changes in the RCS is the normalised log. The boundary between fluctuating (agriculture) and non-fluctuating (woodland or set-aside) regions is determined by thresholding this. The boundary is here shown imposed on the normalised log measure.

Average RCS



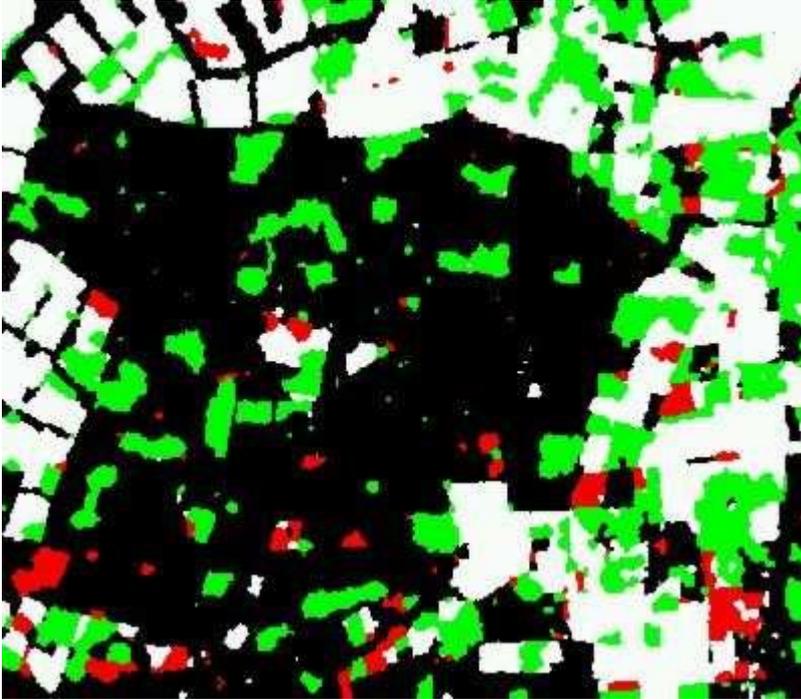
When this boundary is imposed on the average RCS it is clear that it contains comparatively little information about land type. However, the boundary is aligned onto the features in the average RCS image.

Normalised log classification - 1997



Similarly, we classify the changed versus unchanged areas during 1997 using the same temporal texture measure. Note that some regions have a different classification to 1992.

Detected changes in land use, 1992 - 1997



We may compare the land use for 1992 and 1997 by combining the two classifications derived previously.

Black denotes no fluctuations in both 92 and 97 (both woodland or set-aside); red shows fluctuations in 92 (agriculture) but not 97 (woodland or set-aside); green shows fluctuations in 97 (agriculture) but not 92 (woodland or set-aside); white denotes fluctuations in both 92 and 97 (both agriculture).

Note additional clearing for agriculture in 1997 (green areas).

Reference:

P. Lombardo, C.J. Oliver, A maximum Likelihood approach to the detection of changes between multitemporal SAR images

IEE Proceedings on Radar, Sonar and Navigation, Vol. 148, No. 4, August 2001, pp. 200-210