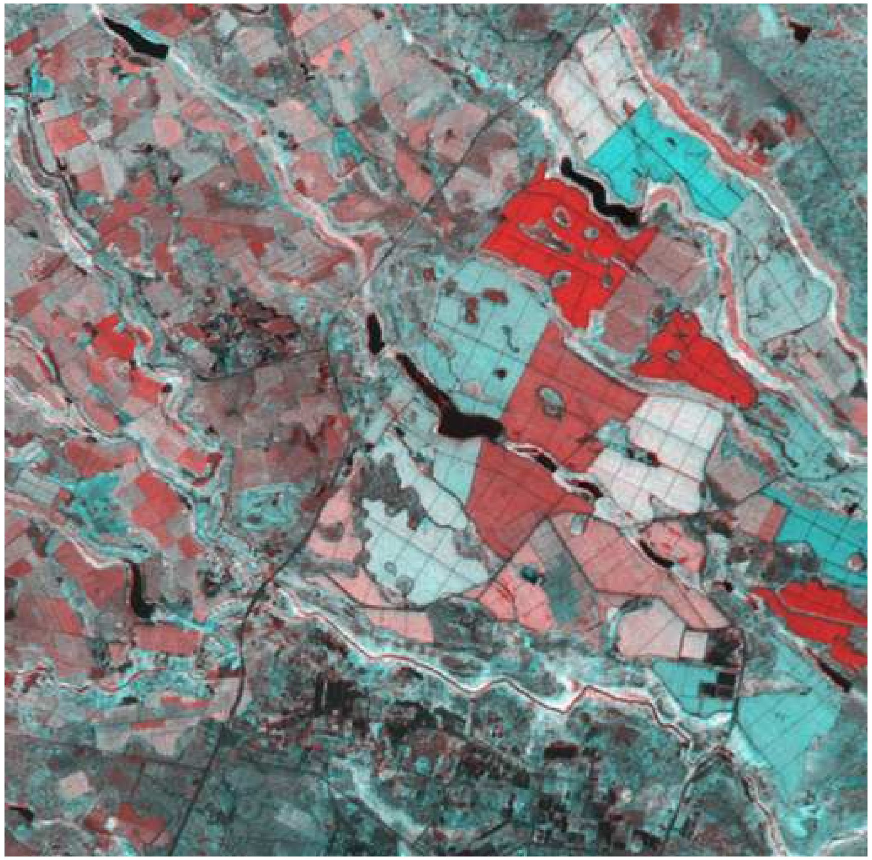

Figure 3.5: 1989 NDVI as red and 1987 NDVI as cyan

where NIR is the near-infrared channel (XS3) and R is the red channel (XS2). The philosophy behind the NDVI is that healthy green matter reflects the near-infrared light strongly and absorbs the red light. Therefore the NDVI will be large in vegetated areas and small in non-vegetated areas. An interesting study on NDVI change detection based on NOAA AVHRR decade (10 day) GAC data from Sudan covering a period of nearly 7 years was presented as a video by Stern (1990). In Figure 3.5 we show the 1989 NDVI as red and 1987 NDVI as cyan (causing no change to be represented by a grey scale). This image enhances the differences between fields in a much clearer way than the simple change detection image. This enhancement is not necessarily due to changes from 1987 to 1989 but may also be explained by differences between, say, crops with no seasonal change at all.

Multivariate Change Detection

In Figures 3.6 and 3.3 we show the canonical variates for the 1987 and the 1989 data (CV3, 2 and 1 in red, green and blue). In Figure 3.8 we show all three MADs (MAD1, 2 and 3 in red, green and blue). Areas with very high and very low values in MAD1 are the areas of maximal change, and the sign of MAD1 indicates the "direction" of change. Note that as with any technique based on eigenanalysis of covariance structures the sign of the transformed variables is arbitrary. An inspection of this image and a comparison with the simple change detection image shows that there is a much better distinction between different types of changes. In the simple change detection image red and cyan are dominating but in the MAD image we see that a much better discrimination has been achieved. In Figure 3.9 we show the absolute value of MAD1 with high values shown in red. This image outlines the areas where large changes occurred irrespective of the nature of the change (irrespective of change e.g. from vegetated to bare soil or *vice versa*, and irrespective of dominating wavelength of change).

Below we give an interpretation of the numerical results from the computations of the MADs and a brief discussion. We discuss (1) correlations between original variables, (2) canonical correlations which are measures of similarity between