

WSRT 1.4 GHz Observations of the Hubble Deep Field

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Abstract. We present WSRT 1.38 GHz observations of the Hubble Deep Field (and flanking fields). 72 hours of data were combined to produce the WSRT's deepest image yet, reaching an r.m.s. noise level of 8 microJy/beam. We detect radio emission from galaxies both in the HDF and HFF which have not been previously detected by recent MERLIN or VLA studies of the field.

1. Background, Observations and Preliminary Results

Deep Radio observations of the Hubble Deep Field region are now advancing our understanding of the faint microJy radio source population. In particular, VLA and MERLIN observations of the HDF (Richards et al. 1999, Muxlow et al. 1999) suggest that faint sub-mJy and microJy radio sources are mostly identified with star forming galaxies, often located at moderate to high redshifts.

In the period April-May 1999 we observed the HDF and HFF with the newly upgraded Westerbork Synthesis Radio Telescope (WSRT) at 1.4 GHz for a total of 72 hours. Our aim was to utilise the WSRT's superb brightness sensitivity to extend the investigation of the microJy source population to extended radio sources that might otherwise be resolved out or go undetected in the previous higher resolution or higher frequency radio observations.

Fig. 1 shows the WSRT image of the HDF/HFF convolved with a circular 15 arcsecond Gaussian restoring beam. This represents the deepest image made with the WSRT to date, reaching a rms noise level of $8\mu\text{Jy}/\text{beam}$. We detect radio emission from galaxies both in the HDF and HFF which have not been previously detected by recent MERLIN or VLA studies of the field. More than 30 new ($> 5\sigma$) detections have been obtained in a 10×10 arcmin field, centred on the HDF. Some of these sources are actually blends of two or more sources but a large percentage are also discrete. Three of the new 1.4 GHz sources are located in the HDF itself, and have infra-red ISO detections. Two of the three are associated with Spiral galaxies and the third is an irregular galaxy (the latter is detected by the VLA at 8.4 but not 1.4 GHz). The new WSRT detections indicate that

perhaps a significant fraction of starburst galaxies present more extended radio emission than the previous (higher resolution) VLA and MERLIN observations suggest.

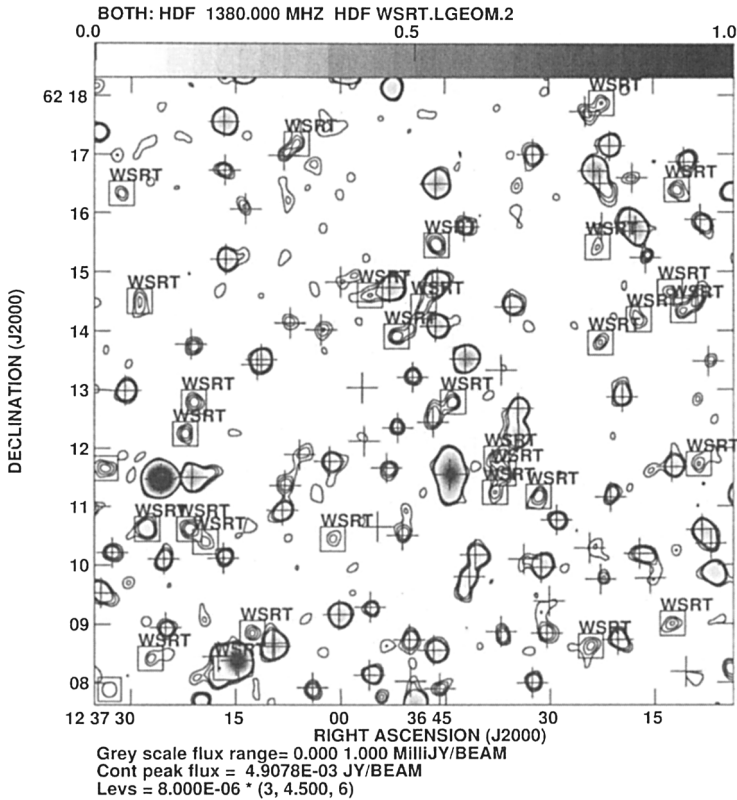


Figure 1. A 10 × 10 arcmin image of the HDF and flanking Fields. Sources previously detected by the VLA are indicated with a cross. Additional sources detected by the WSRT are indicated with a box and label

References

Muxlow, T.W.B., Wilkinson, P.N., Richards, A.M.S., Kellerman, K.I., Richards, E.A., Garrett, M.A. (1999) *New Astronomy Reviews*, **43**, 623.
 Richards, E. A., Kellermann, K. I., Fomalont, E. B., Windhorst, R. A., Partridge, R. B. (1998) *AJ*, **116**, 1039.