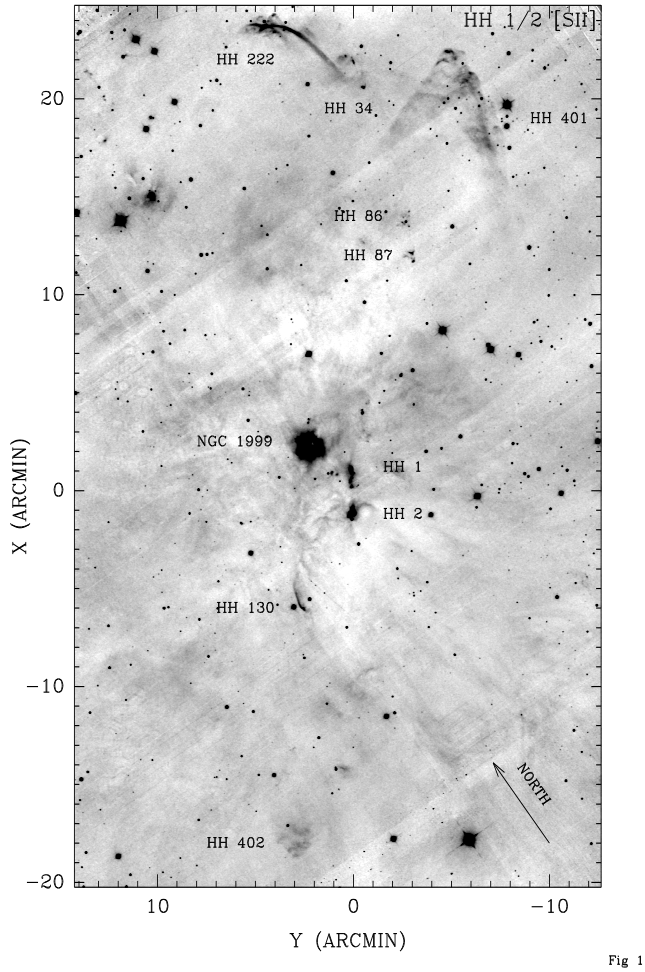

Fig. 6. Wide field [S II] 6716+30 image of the region around HH 1 and 2. This is Figure 1 of Bally et al. (2002).

are seen very clearly in Figure 6, a wide field image from Bally et al. (2002). At smaller angular scales, Reipurth et al. (1993b) reported the discovery of HH 144/145, which emanate from the source region.

As the HH 1 and 2 shocks plough through the ambient medium, they entrain and accelerate the ambient medium, and result in a bipolar molecular outflow. Despite many attempts (e.g., Chernin & Masson 1995; Correia, Griffin, & Saraceno 1997), no certain detection of this molecular counterpart to the optical HH 1/2 flow was achieved until Moro-Martín et al. (1999) obtained high angular resolution and high sensitivity ^{12}CO observations with the IRAM 30 m telescope. The difficulty in detecting this molecular outflow is likely due to the fact that HH 1 and 2 move close to the plane of the sky, as indicated by the high tangential motions and low radial velocities (Herbig & Jones 1981); an approximate angle to the plane of the sky of $\sim$10° was suggested by Noriega-Crespo, Böhm, & Calvet (1991).

Several HH flows in the HH 1/2 region share approximately the same outflow direction, which is perpendicular to filaments outlining the presence of tenuous molecular cloud material (Reipurth 1989). It has been speculated that global magnetic fields might be responsible for aligning the outflow activity in the region, but this has not been borne out by more detailed studies (e.g. Kwon et al. 2010).

3.2. *The source of HH 1 and 2*

In the first papers on HH 1 and 2, it was speculated that the stellar sources exciting the emission could lie within the HH objects themselves. Cohen & Schwartz (1979) later suggested that the source of HH 1 could be the C-S star, $\sim$30″ to the SE of HH 1. The proper motions measured by Herbig & Jones (1981) suggested that both HH 1 and 2 could be the result of a bipolar ejection (the fact that HH 2 is considerably more spatially extended appeared to be consistent with the fact that it is farther away from the C-S star). Mundt & Hartmann (1983) noted that the C-S star does not seem to have a strong enough wind to be able to power HH 1 and 2 (speculating that an eruptive event might have occurred in the past). More recently, Bally et al. (2002) found the C-S star to be a close binary.

Pravdo et al. (1985) reported the radio continuum detection of HH 1 and 2, together with a source lying at mid-distance between the two HH objects. This "VLA 1" source was suggested as producing the HH 1/2 outflow. This is now accepted as being the outflow source, given the fact that a wealth of observational data supports this. Examples of this are the flattened molecular structures (perpendicular to the outflow) surrounding the VLA 1 source (see Torrelles et al. 1994, and references therein) and the resolution of VLA 1 into a radio continuum jet with travelling knots (Rodríguez et al. 2000). The radio continuum study of Rodríguez et al. (2000) also revealed a second, fainter source, VLA 2 about 3 arcsec south of VLA 1. Following the identification of a second small outflow (HH 501, Hester et al. 1998, Reipurth et al. 2000, Bally et al. 2002) emanating from the source region next to the HH 1 jet, Reipurth (2000) argued that VLA 1 must be an unresolved binary, forming a hierarchical triple system with VLA 2.

VLA 1 is a deeply embedded Class 0 source, and the cold infalling envelope around this source was detected at 1300 μm by Reipurth et al. (1993a), who estimated a mass of circumstellar material of $\sim$4 $M_\odot$.