

Variability of Water Masers in W49N: Results from Effelsberg Long-term Monitoring Programme

Busaba H. Kramer^{1,2}, Karl M. Menten¹ and Alex Kraus¹

¹Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, D-53121 Bonn, Germany
email: bkramer@mpifr-bonn.mpg.de

²National Astronomical Research Institute of Thailand, 260 Moo 4, T. Donkaew, Amphur
Maerim, Chiang Mai, 50180, Thailand

Abstract. We present the results from an ongoing long-term monitoring of the 22 GHz H₂O maser in W49N with the 100-m Effelsberg radio telescope from February 2014 to September 2017. The unique Effelsberg's spectral line observation capability provides a broad velocity range coverage from -500 to $+500$ km s⁻¹ with a spectral resolution better than 0.1 km/s. Following the strong major outburst in W49N in late 2013, we have started a long-term monitoring programme at Effelsberg. The major outburst feature (up to 80,000 Jy at $V_{\text{LSR}} - 98$ km s⁻¹) faded away by June 2014. However, we found that the site is still active with several high velocity outbursts (both blue and redshifted). Some features appear at extremely high velocities (up to ± 280 km s⁻¹) and show rapid flux variations within a 1-2 month period. This sub-year scale variability implies that the water masers could be excited by episodic shock propagation caused by a high-velocity protostellar jet.

Keywords. masers, stars: formation, ISM: molecules, radio lines: ISM

1. Summary of the Results

Spectra of the 22 GHz H₂O masers in W49N during 2014-2017 are shown in Figure 1 where selected observations are plotted. Using the VLBA, we identified the location of the 2013 strong outburst to be near the centre of the north-south arc-like structure similar to the previous strong outburst observed with VERA in 2003 (Honma *et al.* 2004) but at different V_{LSR} (-30.7 km s⁻¹). Even though the 2013 outburst faded away by June 2014, we found that the site is still active with several high velocity outbursts (both blue and red shifted). Full detailed analysis will be reported in Kramer *et al.* (in prep.).

On September 7, 2017, we detected a new strong outburst (up to 34,000 Jy at $V_{\text{LSR}} - 82$ km s⁻¹) which have led to further follow-up single dish monitoring and VLBI observations, which are clearly needed.

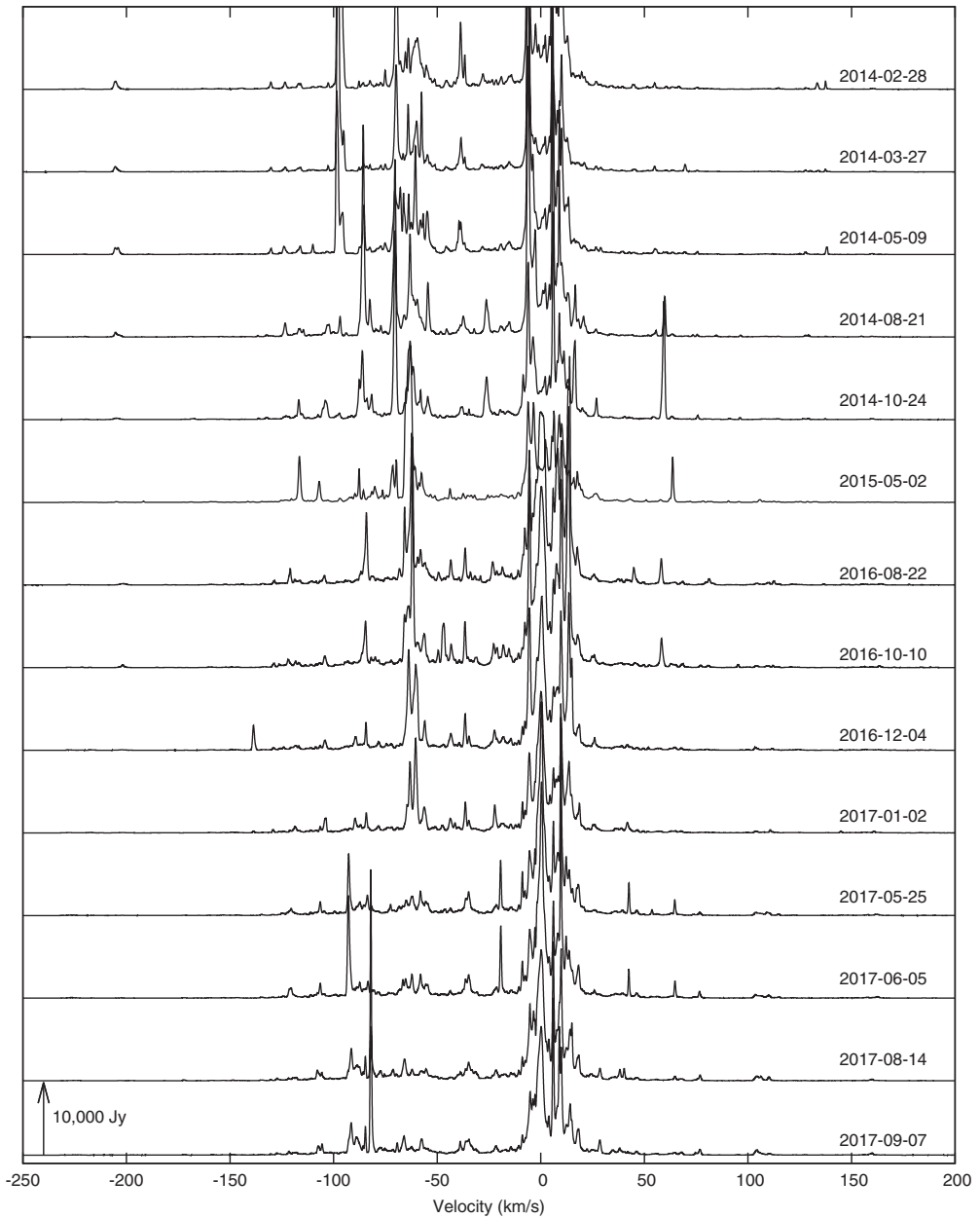


Figure 1. Effelsberg Spectra of the 22-GHz H₂O masers in W49N.

References

- Honma, M., Choi Y. K., Bushimata, T., *et al.* 2004, *PASJ*, 56, L15
Kramer, B. H., *et al.* (in prep).