Abstract

The explanation of how massive stars form is one of the fundamental problems of modern astrophysics. Recent observational and theoretical works in this field suggest that massive young stars, similary to low-mass protostars, accumulate most of their material during short bursts of activity (*episodic accretion*). The study of activity markers for young, massive stars, in particular the 6.7 and 12.2 GHz lines of the methanol (CH_3OH) maser, provides new data to test this theory and discover new outbursts.

This work summarizes my research of the young massive stellar objects using methanol maser emission in 6.7 and 12.2 GHz transitions. I paid particular attention to searching and examining cases of brightening of the maser emission. I utilized observations of the 6.7 GHz transition, performed for over a decade (since 2009) by the 32-m radio telescope of the Institute of Astronomy NCU and I also made the survey of the northern sky in 12.2 GHz line with it. I obtained the observational time at the European VLBI Network (EVN).

My research resulted in discovering of four new sources with 12.2 GHz CH_3OH maser emission of which one: G107.298+5.639, known for its periodicity at the methanol 6.7 and water (H_2O) 22 GHz transitions turned out to by periodic also in the 12.2 GHz methanol line. I discovered periodic, with a period of 5 years, flares of the -0.5 and $-1.3\,\mathrm{km\,s^{-1}}$ spectral features of the 6.7 GHz methanol maser line in Cepheus A (Cep A) component HW2. They are most likely caused by the interactions of the central protostar with its low-mass companion. I also discovered two new periodic sources at the 6.7 GHz transition with long (>400 days) periods: G45.804−0.356 and G49.043−1.079. These findings suggest that the activity level of young, massive stars fluctuates strongly even in short time scales (<1 year), they are often periodic or quasi-periodic, and the reason is primarily interactions with stellar companions in multiple systems.