

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Massive stars are responsible for extremely energetic phenomena in galaxies, they explode as supernovae, end up as black holes. A question about their early phases of evolution is still a clue for modern astrophysics. The more massive star, the higher radiation pressure that tends to explode the object. How to build the massive star before it becomes unstable? Are they form in a similar way to lower mass star like our Sun using disc accretion and outflows or via merging of lower mass stars? Observations are difficult due to dense environment, fast evolution and large distances of high-mass star-forming regions. However, radio wavelengths are able to escape from these gas and dust clouds and inform us about ongoing mechanisms.

In this project we plan to use the radio waves to study the high-mass star-formation. The cm wavelengths from the methanol and water molecules are formed in close surroundings of massive protostars and amplified in the maser mechanism and are able to reach our radio telescopes. Owing to this we can see how the material is “dancing” around a star and see outflows, accretion or expanding bubbles. That is possible owing to the European VLBI Network (www.evlbi.org). We can made extremely detailed images of maser clouds and estimate their motion at the level of 2 km/s.

We will also use the 32 m dish of the Torun Centre for Astronomy. Using this instrument radio astronomers in thousands of observing hours in 1998-2002 scanned the Galactic plane and discovered more than 100 new high-mass star-forming regions. In the recent years the monitoring program was started and some interesting cases were discovered. Some targets are stable in their emission, some show flaring, while a few show periodic variations. Does it give a sign about periodic changes in the central source? We plan to monitor the unique large sample of methanol masers from the northern sky and solve the question what mechanism causes the periodic variation.

In a summary, we would like to see „the invisible”, due to the heavy obscuration, young massive stars that are being formed in our Galaxy.