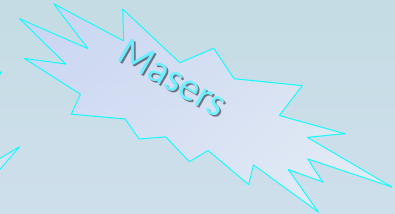
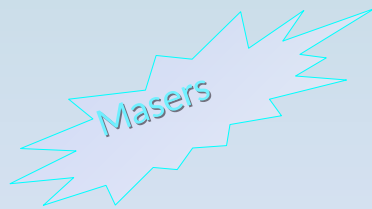


Probing Circumstellar Structures through Masers with EVN & eMERLIN



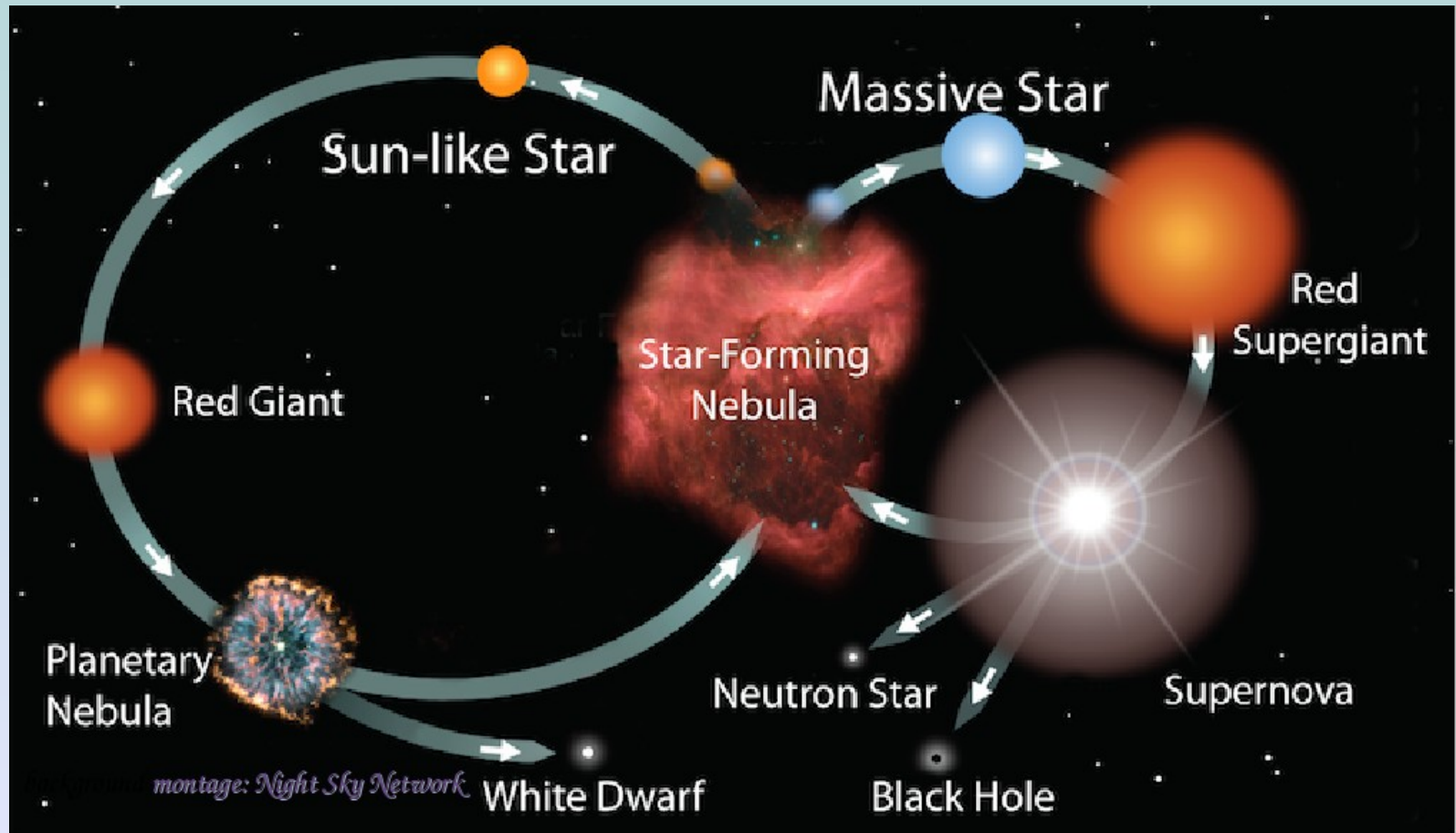
Sandra Etoke

JBCA, University of Manchester



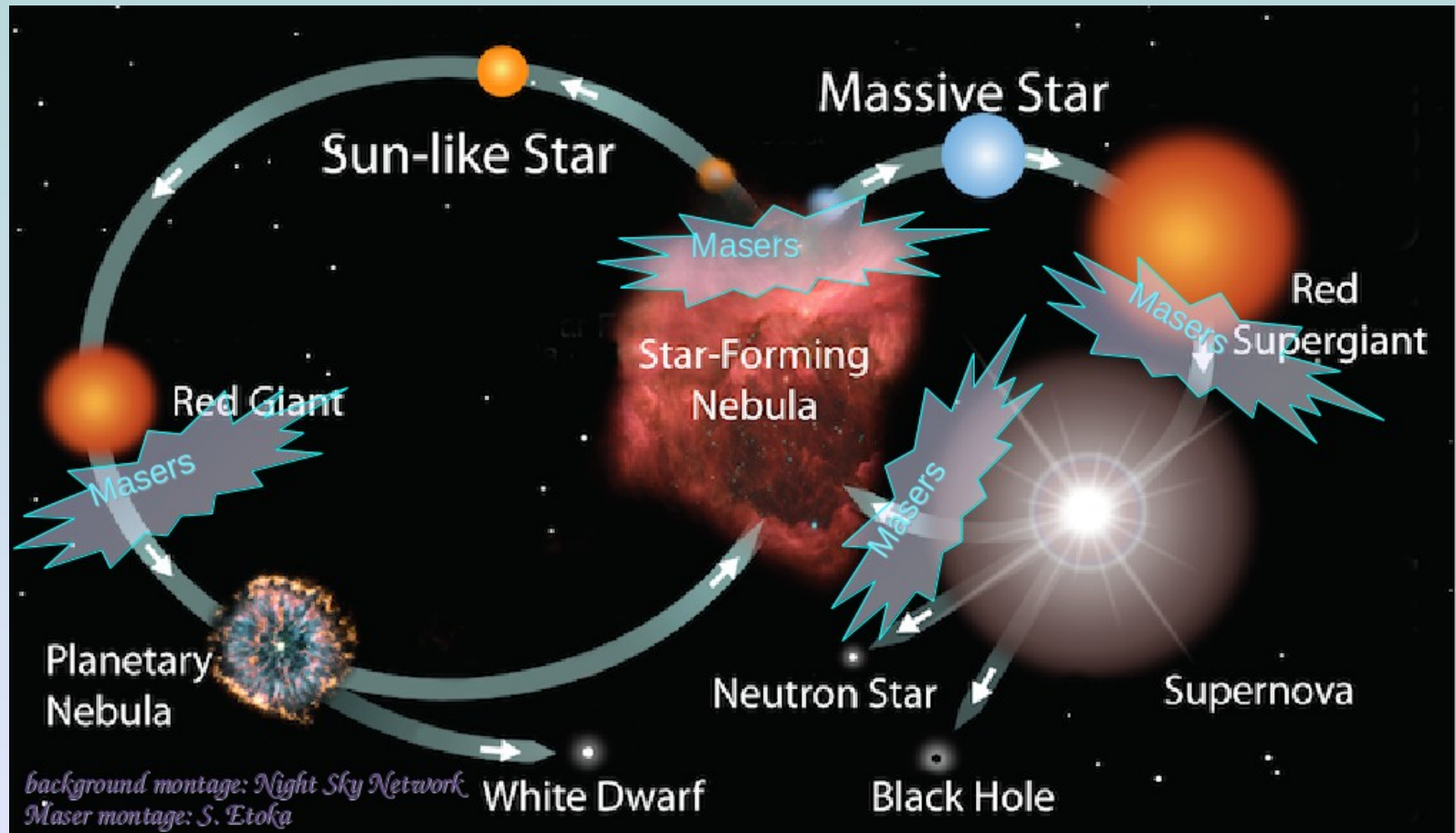
Introduction

- Life cycle of stars: YSOs → RG/RSG (“evolved-stars”) → YSOs
processed matter into the ISM



Introduction

- **Masers** can be found at **different stage of stellar evolution**



Masers as a Tool for Studying Circumstellar Environments

→ Masers are a powerful tool to study 2 crucial moments in the life of a star:

- formation process

most common species: H_2O , CH_3OH and OH

(also detected: SiO , NH_3 , H_2CO , CH_3CHO)

- late stage of evolution

in AGB - PPN& RSG

SiO , H_2O and OH

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probing the (outer part of the) CSE

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probing the (outer part of the) CSE

magnetic field strength and direction (via Zeeman effect)

Research with Masers

- ➔ Role of metallicity in star-formation & late-type star evolution
- ➔ Stellar kinematics
- ➔ Polarisation/Magnetic Field
- ➔ Astrometry & distance determination

Surveys with SKA will detect thousands of stellar- & interstellar-origin masers **in the Milky Way & beyond** (Etoka et al. 2015)

Probing Circumstellar Structures through Masers

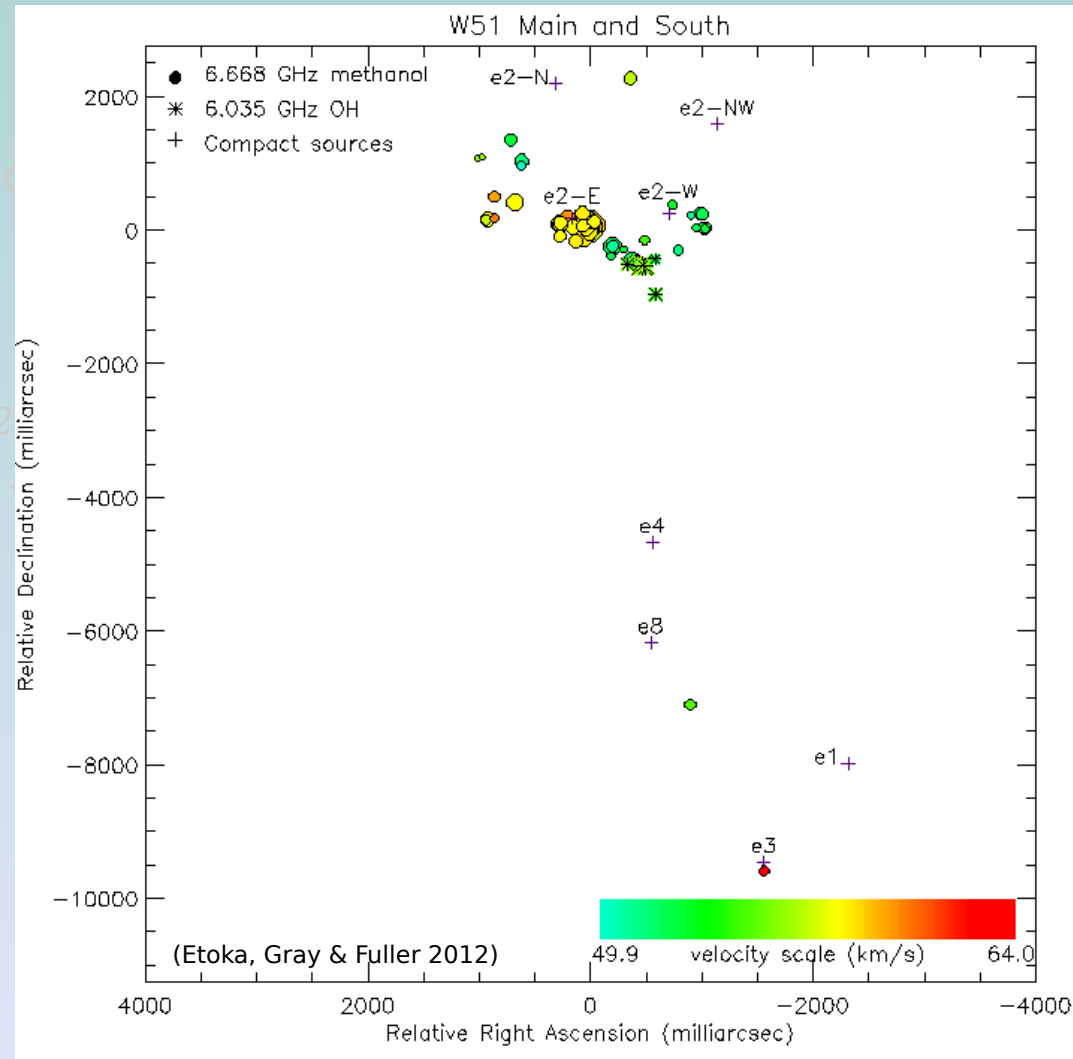
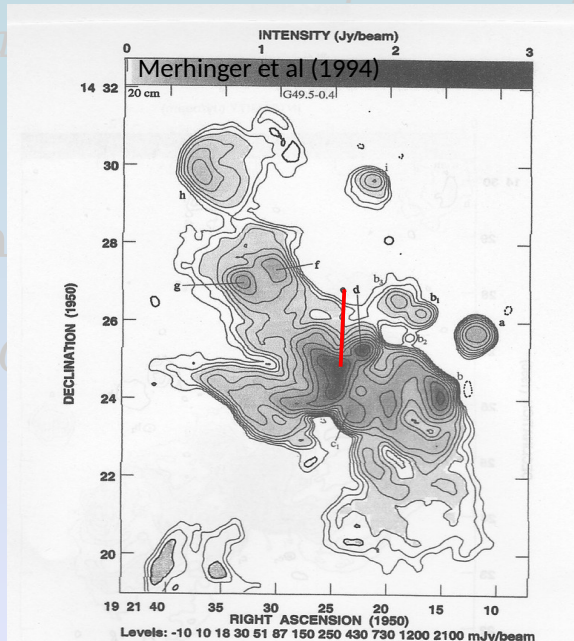
→ Masers are a powerful tool to probe the life of a star:

- formation process

most common species: H_2O

(a)

- large
in
size



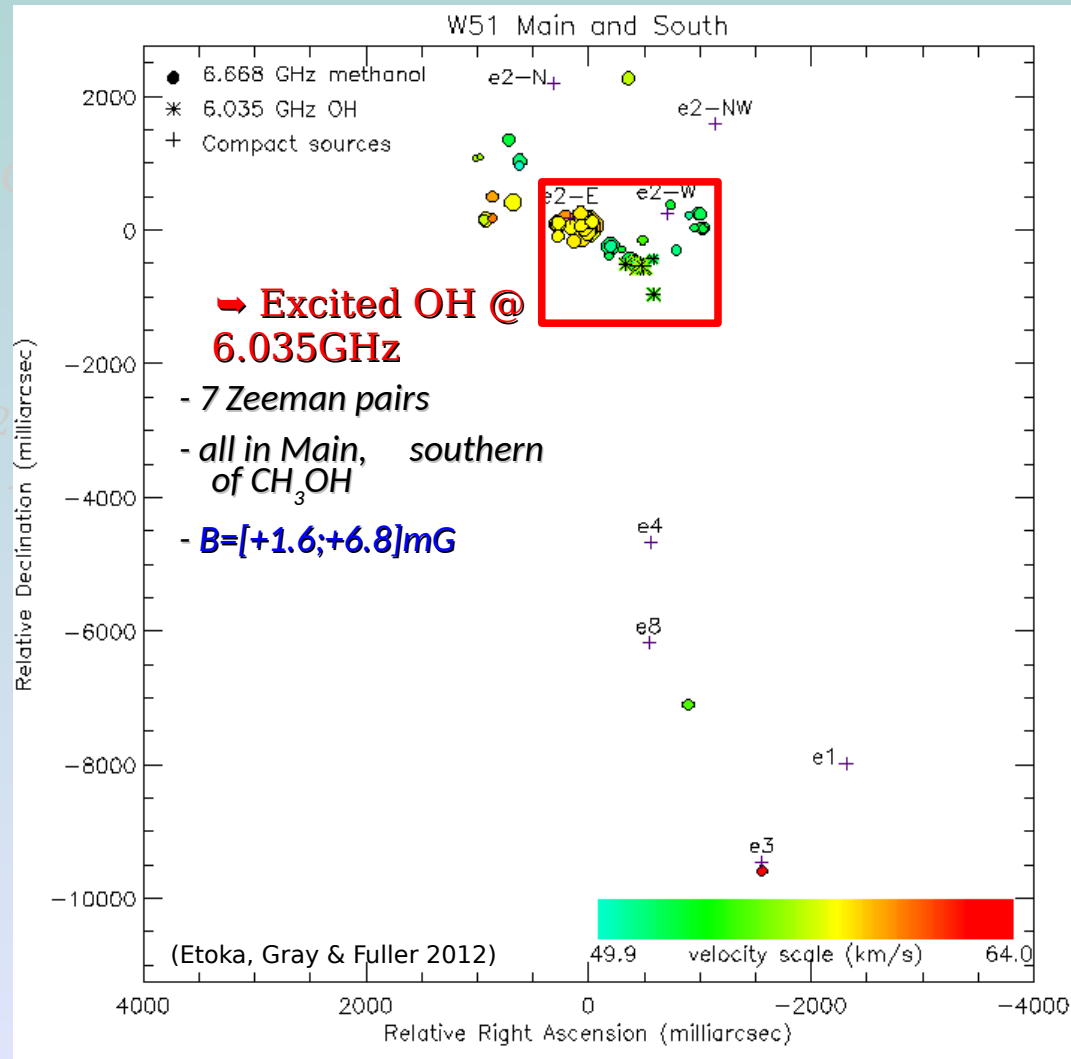
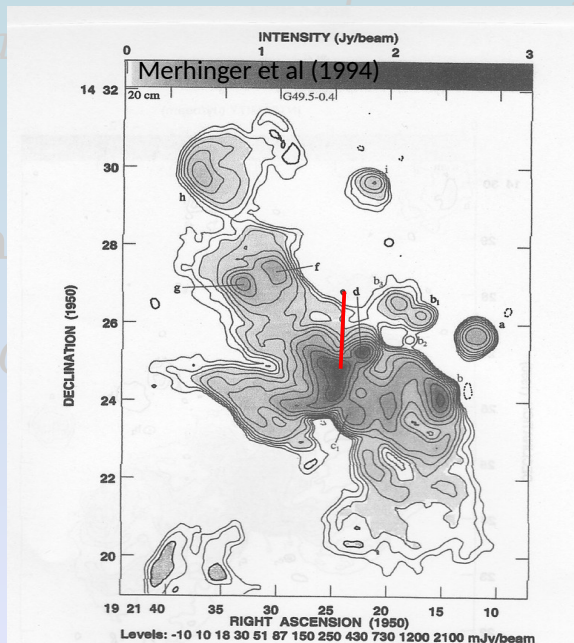
Probing Circumstellar Structures through Masers

→ Masers are a powerful tool to probe the life of a star:

- formation process

most common species: H_2

- late in the life of a star



Probing Circumstellar Structures through Masers

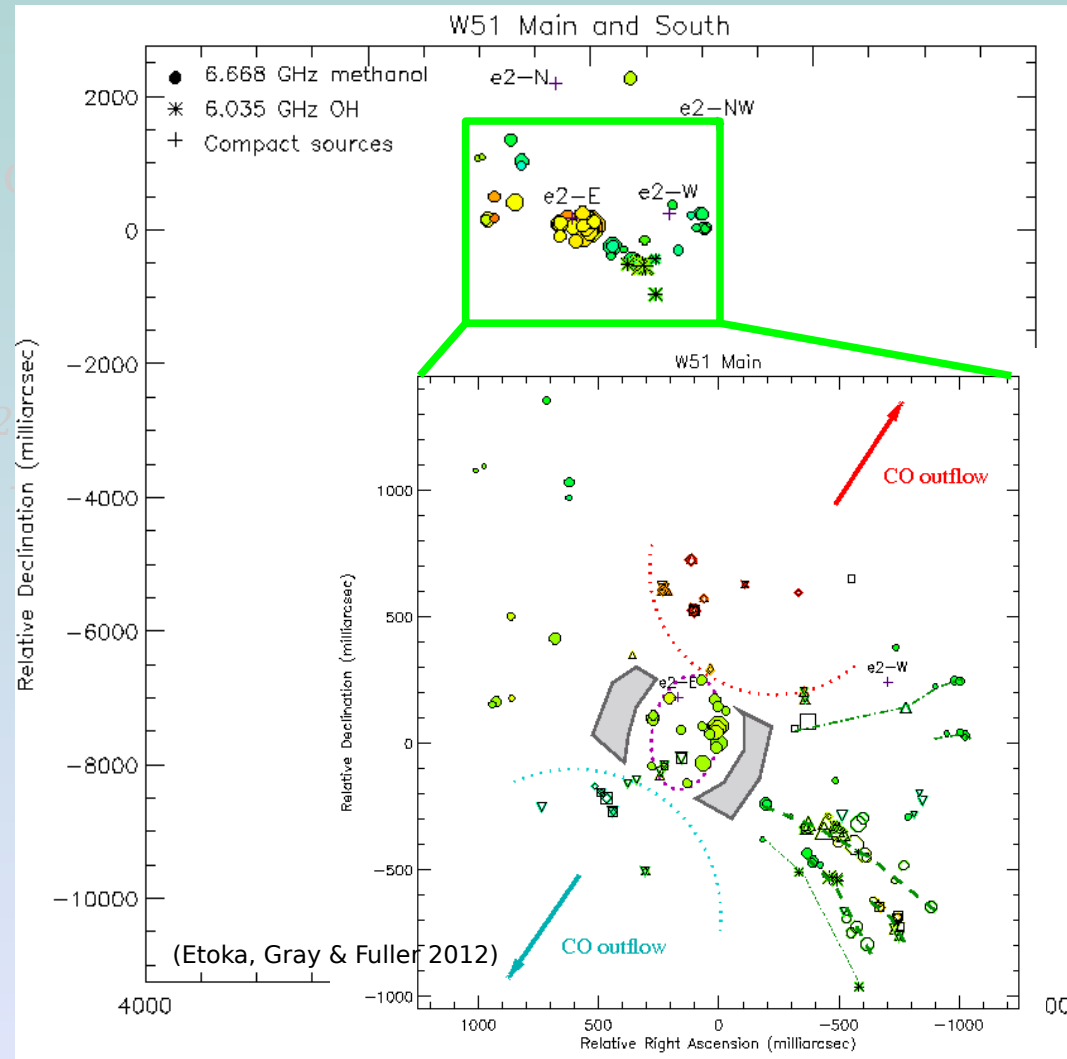
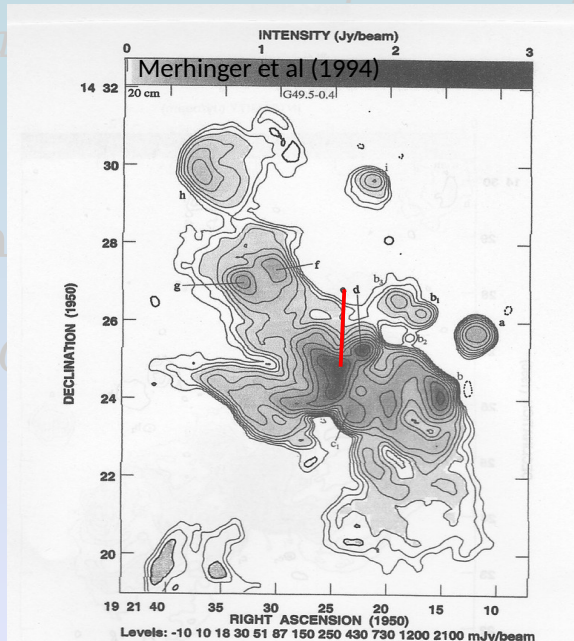
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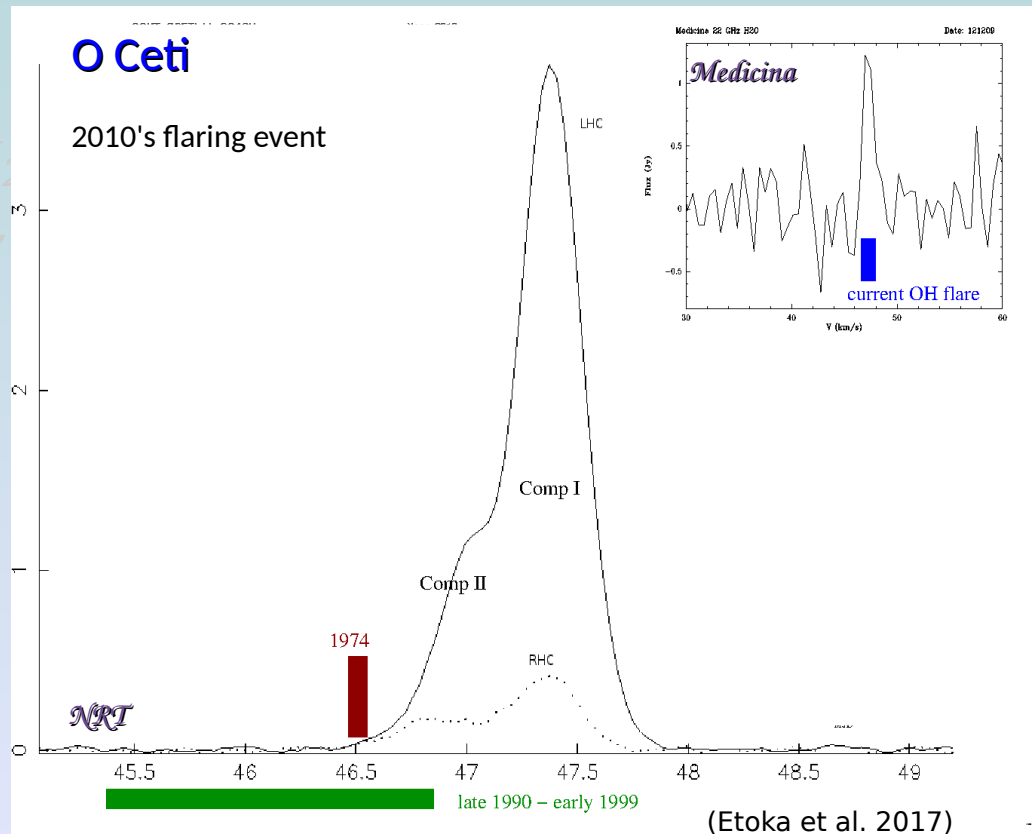


Probing Circumstellar Structures through Masers

→ Masers are a powerful tool to study 2 crucial moments in the life of a star:

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most common species: H₂
(also detected: SiO, NH₃,

- late stage of evolution
in AGB - PPN& RSG
SiO, H₂O and OH

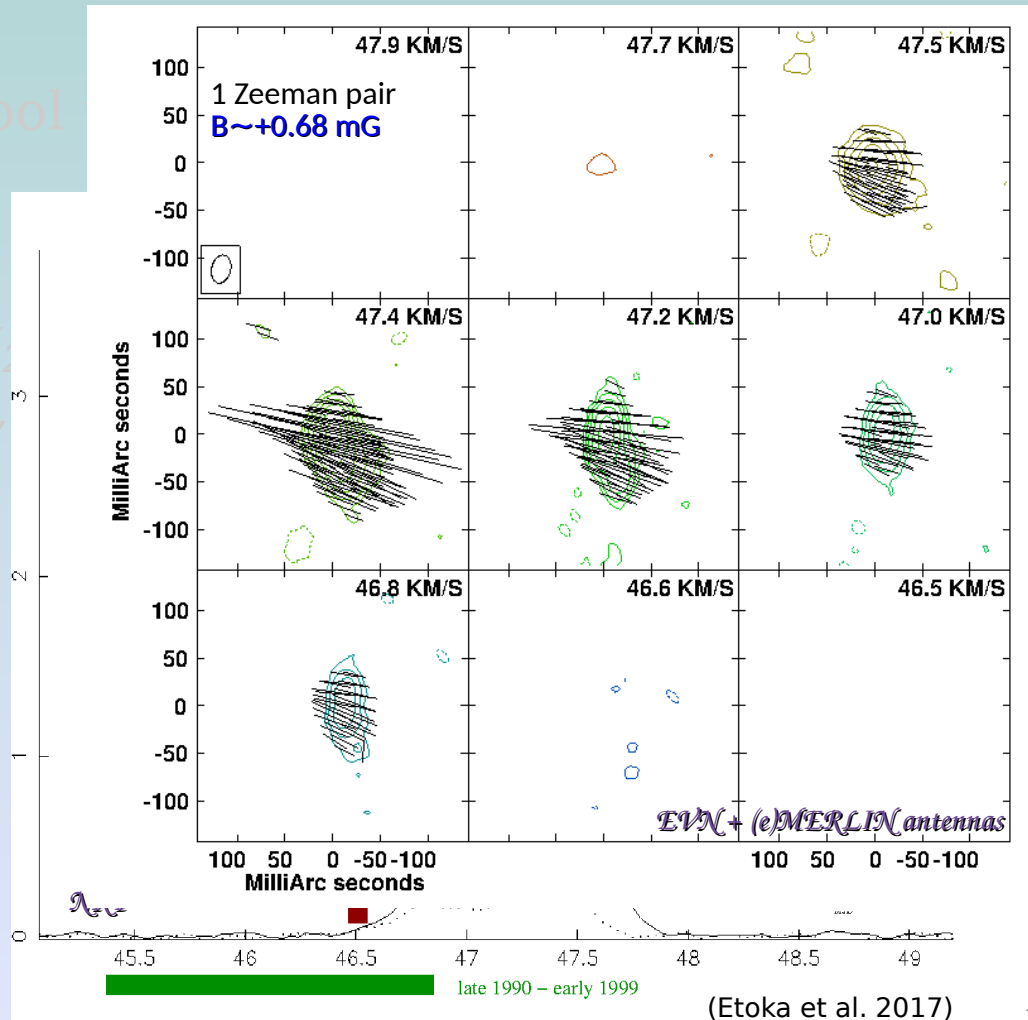


Probing Circumstellar Structures through Masers

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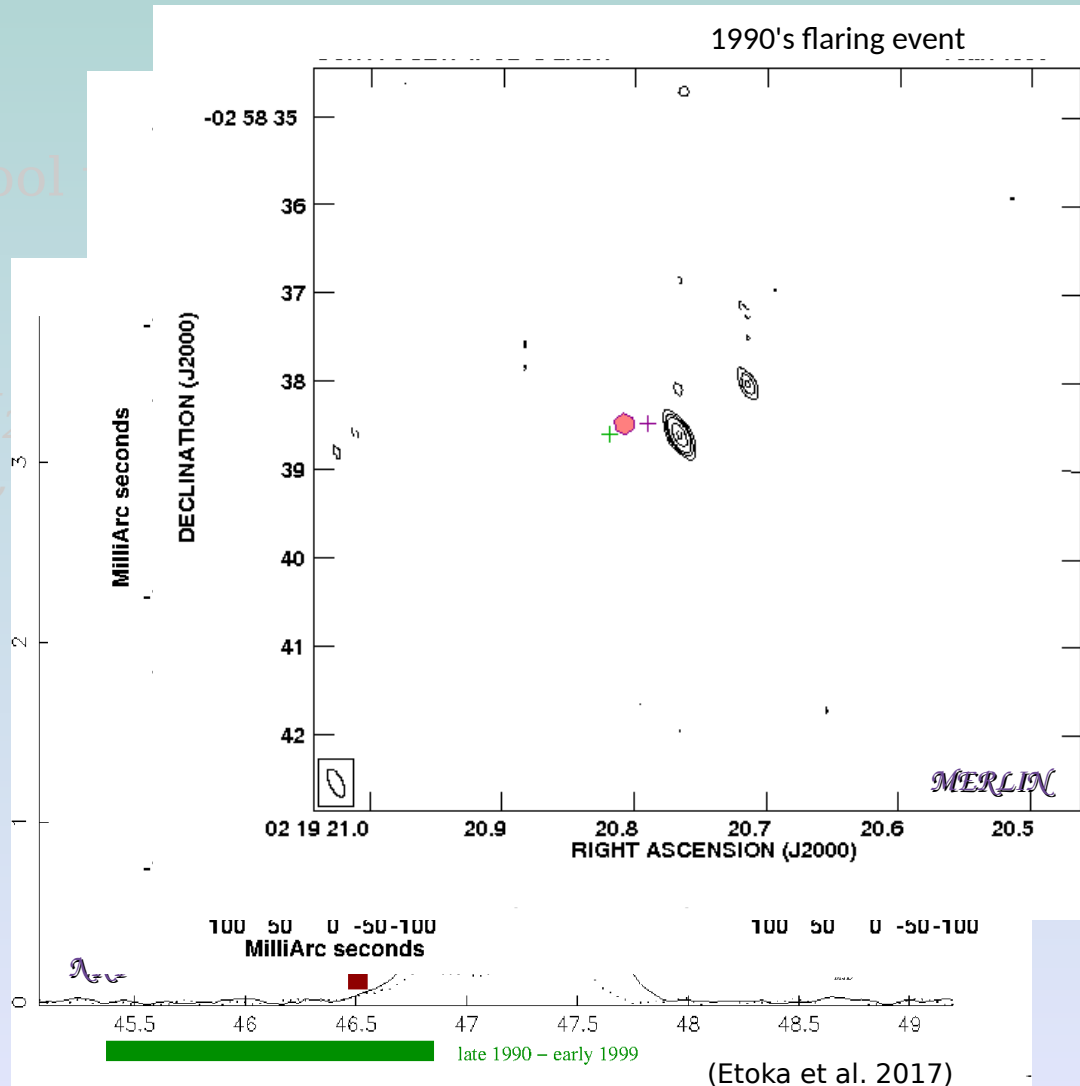


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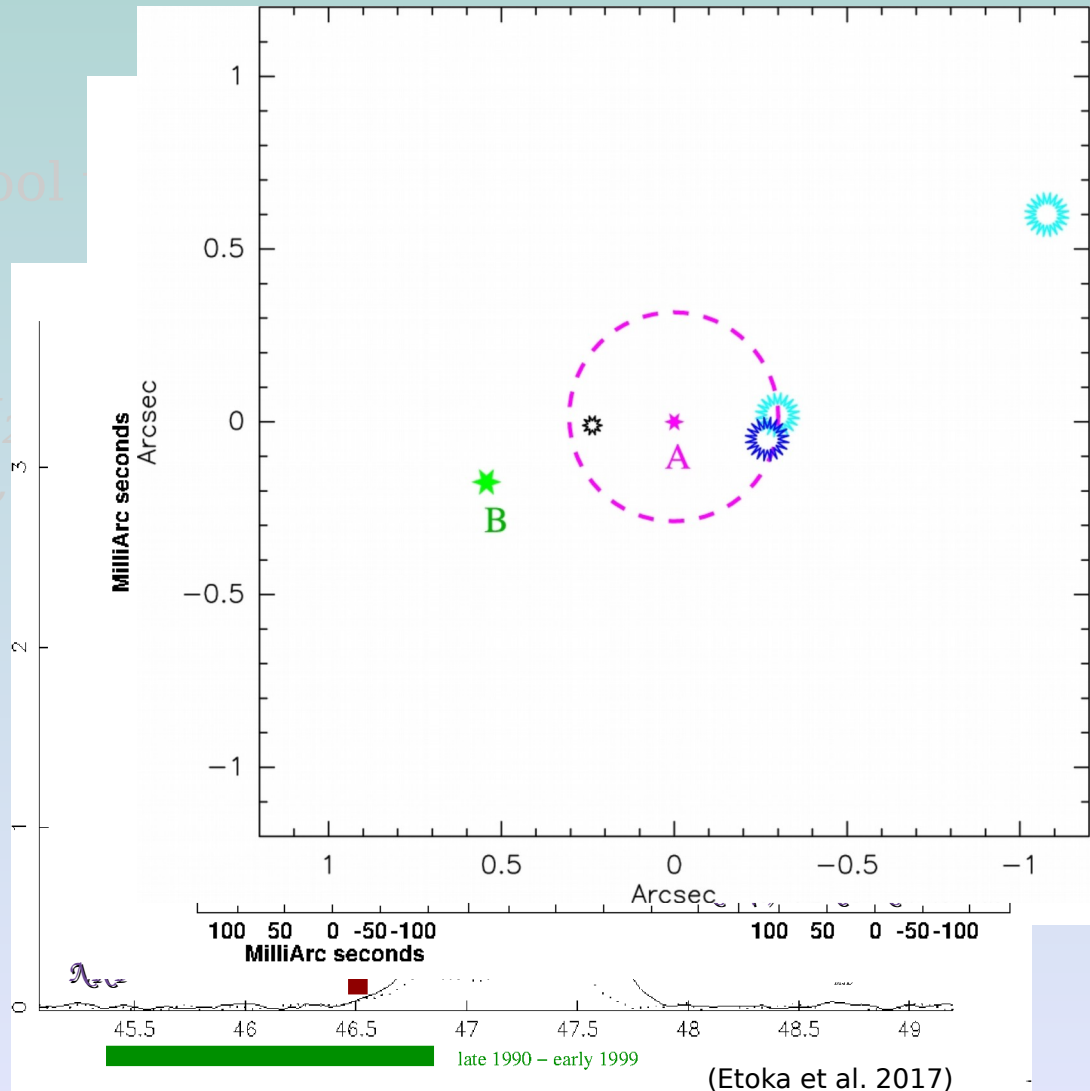


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Closing Note

→ SKA will provide the survey capability to search for maser emission from SFRs & evolved stars in a more sensitive & systematic way than currently possible allowing us not only to explore the Milky Way further and deeper (*e.g. passed the Galactic Center*) but also beyond it

BUT

→ The eMERLIN and EVN high-sensitivity & comparable/higher angular resolution interferometers are needed to investigate the actual structure of these objects

Wishing List

8-13 GHz OH

- Ideal to piggyback searches on SFR continuum imaging (& post-AGB/RSG?)
- Next steps up in ${}^2\Pi_{3/2}$ and ${}^2\Pi_{1/2}$ ladders
 - Never yet well-resolved
- 13.4 GHz OH in 10-20% of UCHII regions with 6 GHz OH *Baudry, Caswell* surveys
 - Short-lived stage in massive star evolution
 - Last surviving OH maser as HII region ionises? *Breen*
 - 23 GHz OH ~thermal *Baudry+95*
 - Constrain OH pumping models
 - Measure magnetic field in warm regions
- 8.2 GHz reported in W3(OH) *Baudry+93*

