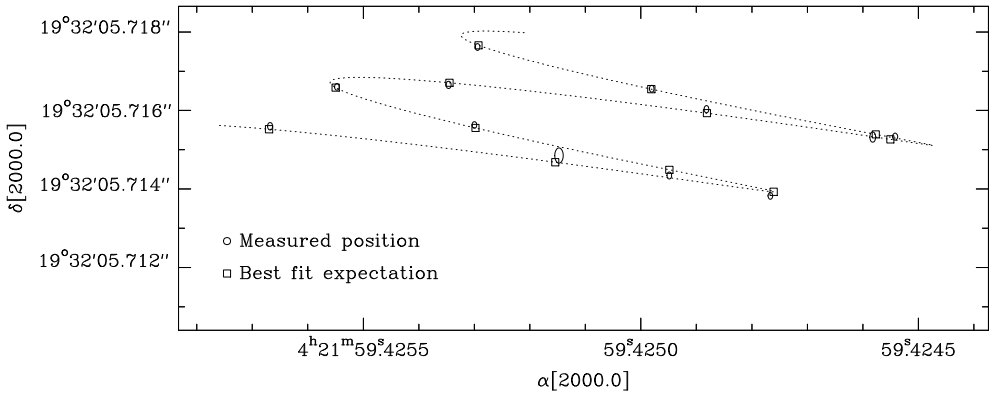

Fig. 1. Trajectory of T Tau Sb on the plane of the sky as measured by multi-epoch observations. The data were collected at 12 epochs from September 2003 to July 2005, and are shown as ellipses whose sizes represent the error bars. The dotted curve shows the best fit with a combination of parallax and proper motion. The squares are the positions predicted by the best fit at the twelve epochs (see Loinard et al. 2007 for details).

$d \approx 100$ pc). In high mass star-forming regions, water and methanol masers (which are also detectable with VLBI instruments) are common, and offer an interesting alternative to magnetically active low-mass stars. Although we will mention a few results obtained from maser observations, we will be primarily concerned here with low and intermediate mass star-forming regions where masers are of limited use because they are rare and often strongly variable.

2. RESULTS

Over the last five years, we have measured the distance to several nearby young stars using multi-epoch VLBI observations. As an example, we show in Figure 1 the trajectory described on the plane of the sky by T Tau Sb, one of the southern companions of the famous object T Tauri as characterized by multi-epoch VLBI observations (see Loinard et al. 2007 for details). That trajectory is the combination of an elliptic parallax component and the proper motion of the source – oriented towards the south-east, in this specific case. Note that the entire size of the figure is only about 10 mas.

The young stars considered so far are all located in the five most prominent nearby star-forming regions (Ophiuchus, Taurus, Perseus, Serpens, and Orion). These regions belong to Gould's Belt, the ring-like structure where most star-formation within a few hundred parsecs of the Sun is concentrated. In the coming sections, we will summarize these results, and discuss some pending issues.

2.1. *Ophiuchus*

During many years, Ophiuchus was thought to be at 165 pc (Chini 1981). More recently, however, shorter distances have been preferred. For example, de Geus et al. (1989) found a mean photometric distance of 125 ± 25 pc for the stellar population associated with Ophiuchus. Knude & Hög (1998), who examined the reddening of stars in the direction of Ophiuchus as a function of their Hipparcos distances, found a clear extinction jump at 120 pc and agued that this corresponds to the distance of the main dust component in Ophiuchus. Using a similar method, Lombardi et al. (2008) also reported a distance of about 120 pc for the Ophiuchus core.

Using VLBI observations, Loinard et al. (2008) measured the trigonometric parallax of two stars in the Ophiuchus core (S1 and DoAr21), and found a mean value of 120.0 ± 4.5 pc. The Ophiuchus core is only about 2 degrees across, corresponding to a linear radius of about 2 pc. The depth of the region is expected to be similar, so systematic errors on the distance to individual objects in the Ophiuchus core due to its depth are expected to be of that order. To account for that effect, we add quadratically 2 pc to the formal errors reported by Loinard et al. (2008), and conclude that the distance to the Ophiuchus core should be assumed to be 120 ± 5 pc.

In addition to its core, Ophiuchus contains several filamentary structures known as the *streamers* (see Wikling et al. 2008). The streamers correspond to prominent dust clouds (such as Lynds 1689, 1709, 1712, or 1729) and extend to about 10 pc from the core. They are thought to be physically associated with the Ophiuchus core, and should therefore be at similar distances (within about 10 pc, their physical extent on the plane of the sky). There are several indications that this might indeed be the case. For instance, Lombardi et al. (2008) found some indica-