

the Galactic centre can be found independently, from studies of globular clusters, which reach a peak of density per cubic parsec in the Galactic centre (using RR Lyrae as standard candles) ✓

The Rotation of the disc can be studied using stars in the disc, but this is not very efficient as stars do not move in completely circular orbits, and because of obscuration by dust/gas in the disc. More efficient are studies of gas via radio wavelengths, to which material in the disc is fairly transparent. Gas also has the advantage of moving in fairly circular orbits; in non circular orbits, viscous friction in the gas would destroy the orbit. In studies of this kind, the 21cm hydrogen and 2.6mm Carbon monoxide lines are typically used. The local circular (orbital) velocity of the gas is calculated from its Doppler shift, after allowing for velocity of Sun. The radial distance of the gas from the Galactic centre can be found from trigonometry as shown:

use emission lines
from the gas