The origin of thick discs and some comparisons on the results on the thick disc in the Milky Way with those on nearby galaxies

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Thick discs are disc-like components with a scale height larger than that of the classical discs. They are most easily detected in close to edge-on galaxies in which they appear as a roughly exponential excess of light seen a few thin disc scale heights above the midplane. Their origin remains controversial and several formation theories have been proposed. Unveiling the origin of thick discs is important for understanding galaxy evolutionary processes.

Some theories proposed for the formation of thick discs are:

- The thick disc are formed secularly by thin disc stars heated by disc overdensities such as giant molecular clouds or spiral arms and by stars moved outwards from their original orbits by radial migration mechanisms.
- The thick disc are formed by the heating of the thin disc by satellites and from stars tidally stripped from the satellites.
- The thick disc are formed fast and already thick at high redshift in an highly unstable disc. Inside that thick disc, a thin disc would form afterwards.
- The thick disc are formed originally thick at high redshift by the merger of gas-rich protogalactic fragments and a thin disc forming afterwards within it.

The first mechanism of thick disc formation is a secular evolution mechanism and the two last ones would produce in situ thick discs in a short time-scale at high redshift. The second mechanism nature depends on the merging history of galaxies.

Recent Milky Way studies tend to point to a secular evolution origin of the thick disc. On the other hand, studies of samples of nearby galaxies seem to indicate a high-redshift origin for at least the thick discs in low-mass galaxies.

I will also point to an unsolved contradiction between the Galactic and extragalactic data, namely that recent studies seem to indicate that the Milky Way thick disc has a shorter scale length than the thin disc, but the opposite behaviour is observed in most nearby edge-on galaxies.