

Recently, a heliocentric dust ring on Venus orbit has been detected and some of its parameters have been evaluated (Leinert & Moster, 2007; Jones et al., 2013, 2017; Pokorny & Kuchner, 2019; Stenborg et al., 2021). This region of space gets crossed by spacecrafts using Venus as a gravity assist or studying Venus, Mercury or the Sun, so the impact risks it may pose to such spacecrafts have to be computed. Two recent examples of these types of satellites are Bepi-Colombo, which recently used Venus to perform two gravity assist manoeuvres, and JUICE, which will also use Venus for gravity assist manoeuvres.

To compute the impact flux from the dust ring, the orbits of those particles and the shape of the ring need to be investigated. To do this, we developed a model of the dust ring, based on data from the papers cited in introduction. From this model, the evolution of the ring over 2000 years was computed.

It tends to spread out in width, with the smallest particles drifting the closest to the Sun. It also spreads out slightly in height. The number density in the ring is particularly high right near Venus orbit, then decreases sharply both in width and height.

The number of particles in the ring is then computed. From this, the impact flux is evaluated on Bepi-Colombo, which serves as an example of a spacecraft crossing the ring. The speed and direction of impacts are also computed. From these three indicators (number, speed and direction of impacts), a first assessment of the risk posed by the ring can be done: it does not seem to be a major threat. However, this study showed clearly the lack of data we have on the dust ring, and it is therefore highly necessary to keep monitoring it to gather more information.