

# “Orbit determination at Minor Planet Center, an overview: recent improvement and future developments”

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The Minor Planet Center (MPC) is a NASA funded project that operates at the Smithsonian Astrophysical Observatory and is the single worldwide location for receipt and distribution of positional measurements of minor planets, comets and outer irregular natural satellites of the major planets (<https://minorplanetcenter.net/>).

Orbit determination plays a crucial role in the data processing: it's fundamental to assess the reliability of the discoveries and the quality of the observations. Given the different nature of minor planets, comets and irregular satellites of major planets and the different techniques required to acquire their observations, different orbit determination methods have been created to handle different types of objects. Moreover, in the category of minor planets, short-arc orbit determination algorithms are very different from the ones used to handle long-arcs and very accurate observations.

I will present the algorithms that are currently part of the MPC different processing pipelines, focusing on the efforts to make the process automated and to keep a constant output validation. I will also present how we estimate the quality of the orbits and we handle observation rejections and bad tracklets. The last part of the talk will be focused on the challenges that we need to overcome in the near future to handle the enormous increase of data that we are expecting in the following years.