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(U*) (POS-9) Tidal Circularization and Migration in "Tatooine"/Circumbinary Systems

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Originally the subject of Star Wars science-fiction, astronomers have discovered planets orbiting twin suns, just like on the fictional planet Tatooine appearing in Star Wars Episode IV: A New Hope. More commonly known as circumbinary planets, these systems are ones in which the planet is in orbit around both binary stars. In these gaseous bodies, tidal forces induce interior gaseous mixing of the stars, of which facilitates an energy transfer that dissipates orbital energy. This orbital energy dissipation results in a decrease of both the binary semi-major axis, ab, and the binary eccentricity, eb. My work focuses on this stage of binary evolution, namely, the tidal circularization (reduced semi-major axis, ab) and migration (reduced eccentricity, eb) of binary stars and the significance of the affects of this stellar evolution on the planetary stability in these circumbinary or "Tatooine"systems. Previous works have not explained how the binary's tidal migration and circularization affects the stability of the circumbinary planets, as they only considered the gravitational force. Because no circumbinary planets have been detected around binaries with orbital periods less than 7 days (Martin 2018), where tidal circularization is expected to be very efficient (e.g. Zanazzi, 2021), my study will shed light on the deficit of circumbinary planets orbiting short period binaries.

Keyword-1

Binary Star

Keyword-2

Tides

Keyword-3

Orbital Dynamics

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