Effects of eccentricity on habitability of planets

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Since the first discovery of an extrasolar planet in 1995, about 150 extrasolar planets have been reported.

These planets are considered to be giant planets. Some of these extrasolar planets, though which are considered to be giant olanets, have very high eccentricity that cannot be found in our solar system planets. Such 'eccentric' giant planets may harbor giant satellite around them. In addition, even eccentric terrestrial planets may exist.

When we consider the habitability on such giant satellite and terrestrial planets, it is important to take the effect of eccentricity into account.

The effect of eccentricity on planetary climate is not a simple one.

Mean annual solar radiation does not depend on eccentricity. However, the climate is not a linear function of insolation because of various feedbacks, such as ice albedo feedback or runaway greenhouse feedback. Therefore, temporal variation of insolation caused by eccentricity can affect the mean annual temperature.

For this reason, it is inadequate to estimate planetary climate from mean annual solar radiation.

We considered a hypothetical Earth-like plants orbiting a Sun-like star with various eccentricity and performed numerical simulation by taking into account the ice albedo feedback.

We present the result of simulation and discuss the effects on habitability caused by eccentricity.