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Dynamic habitability of extrasolar planetary systems

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The potential existence of habitable Earth-type planets in selected extrasolar planetary systems is investigated. Indicator for the habitability of such planets is the theoretical appearance of photosynthesis-based life on them. For determining the habitable zone an integrated system approach is used taking into account a variety of climatological, biogeochemical, and gedynamical processes. For the development of life, Earth-type planets have to revolve their host stars sufficiently long on a stable orbit situated in the habitable zone. Such a constellation is denoted as dynamically habitable. In the extrasolar planetary systems ϵ Eridani, 55 Cancri, 47 Ursae Majoris, and ρ Coronae Borealis the existence of dynamically habitable Earth-twins is in principle possible. Old age severely restricts habitability. Admittedly, the likelihood depends critically on the percentage of the planetary land/ocean coverage. It is significantly increased for planets with a high proportion of ocean surface (water worlds). According to dynamical simulations the formation of terrestrial wet planets like the Earth seems to be very plausible.