

*Origin of modern atolls: Challenging the deeply engrained Darwin's Theory*

**Stephan JORRY (IFREMER)**

In 1842, Darwin identified three types of reefs: “fringing reefs” directly attached to volcanic islands, “barrier reefs” separated from volcanic islands by lagoons, and “ring reefs” enclosing only a lagoon, defined as atolls. Moreover, he linked these reef types in an evolutionary model in which an atoll is the logical conclusion of a subsiding volcanic edifice, unaware of Quaternary glaciations. As an alternative, several authors, starting in the 1930’s, proposed an antecedent karst model, in which atolls formed as a direct interaction between subsidence, karst dissolution, preferentially in bank interior than on their margins, developed during glacial lowstand exposures and stacked coral reef growth along their margins during highstand re-flooding. Based on well established last 5 My sea level fluctuations and building on the antecedent karst model, we are proposing a comprehensive model by demonstrating that most modern atolls, in a wide range of subsidence rates, from the Maldives Archipelago, and tropical Pacific and SW Indian Oceans, are rooted on top of Late Pliocene flat-topped banks. During the multiple glacial sea level lowstands, intensifying throughout the Quaternary, their tops were karstified. During each one of the five mid-to-late Brunhes deglaciations, coral re-occupied their raised margins and grew vertically keeping up with sea level rise, creating the modern atolls as we know them.