Biodiversity is ongoing major losses both in rate and scale due to human activities. Several causes are implied, among which four are reasonably well documented: habitat loss (e.g., destruction, land-use changes and fragmentation), biological invasions, pollution and wildlife overexploitation. A fifth cause, global climate and atmospheric changes, is raising rising concern, as it is only starting to show effects, and all global studies on climate change impacts project a substantial loss of biodiversity.

Despite the major impact that global climate and atmospheric changes could have on many components of the environment, these studies remain surprisingly few, and are restricted to certain components of climate changes and of the biodiversity. Indeed, most studies have insofar focused on global warming and the effect the elevation of temperature could have directly on the geographical distribution shift and the extinctions of species. These studies also generally focus on continental ecosystems.

Yet, almost no studies have been published on the impact of sea level rise on biodiversity, despite its obvious importance in conservation biology. This is all the more surprising as global rise of sea level is one of the most certain outcomes of global warming. Its amplitude is however subject to debate. Although for the second half of the last century, the overall rate of the global rise is only between 3.3 mm/yr, according to the last IPCC report, the expected sea-level rise for 2090-2099 was estimated to be between 18 and 59 cm. Results of the ongoing research and recent observations suggest that the IPCC conclusions concerning the future rate of the global mean sea level may be very much on the conservative side.

First, there is widespread evidence of the increased melting of glaciers and ice caps from the mid-1990s and, second, it has recently been observed that Greenland and Antarctic ice sheets show a relatively fast dynamic response to global warming. Moreover, the data from coastal tide gauges corroborates the recent satellite estimates of sea level change and show that the current rate of sea level rise corresponds to the upper limit of model projections given in the IPCC Assessments in both 2001 and 2007. Recent studies predict a sea-level rise ranging from 0.75 to 1.9 m by the year 2100. Other estimate that sea level rise from melting of ice sheets may reach 4 to 6 m during this period, while
James Hansen, the “father” of global warming, evaluated a potential rise by 5 meters by that year.

Global warming could raise sea level by several meters during the next centuries leading to the total immersion of many islands and islets with low elevation. Curiously, although it is clear that rising sea levels could lead to numerous losses of islands and atolls, no studies quantified this effect on islands and global biodiversity. However, such loss of islands could have a direct and dramatic effect on biodiversity, which is notoriously very rich on insular ecosystems. Despite a very small land coverage, islands are considered as global centers of endemism richness. For example, islands have a very high rate of endemism: 8.1 and 9.5 times higher than on continents for vascular plants and vertebrates, respectively. In total, about 70,000 vascular plant species are endemic to islands. Currently, around one sixth of threatened plant species, a third of which are endemic, are found on islands. Five out of the 20 global centers of plant species richness and 9 out of the 25 global biodiversity hotspots are totally or mainly islands. Therefore, island biodiversity is of paramount importance to global biodiversity and worldwide sea level rise could play an important role in its future.

In this presentation, we will show our current progresses in characterizing the impact of sea level rise on insular biodiversity, by estimating the number of islands that might be totally submerged by sea level rise. To this aim, we completed and analyzed a comprehensive database of all French islands over the world (taken as a representative sample of all worldwide islands) and estimated the number of islands entirely lost by 2100, under different climatic scenarios as well as the consecutive loss of biodiversity on these islands.

We will then discuss the relative importance of this understudied threat, one of many that will likely affect the biodiversity of the over 180 000 islands in the world following global changes.