Project TANDEM (Tsunamis in the Atlantic and the English ChaNnel: Definition of the Effects through numerical Modeling) (2014-2018): a French initiative to draw lessons from the Tohoku-oki tsunami on French coastal nuclear facilities

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TANDEM (Tsunamis in the Atlantic and the English ChaNnel: Definition of the Effects through numerical Modeling) is a French research project dedicated to the appraisal of coastal effects due to tsunami waves on the French coastlines, with a special focus on the Atlantic and Channel coastlines, where French civil nuclear facilities have been operating since about 30 years. This project aims at drawing conclusions from the 2011 catastrophic tsunami, and will allow, together with a Japanese research partner, to design, adapt and validate numerical methods of tsunami hazard assessment, using the outstanding database of the 2011 tsunami. Then the validated methods will be applied to estimate, as accurately as possible, the tsunami hazard for the French Atlantic and Channel coastlines, in order to provide guidance for risk assessment on the nuclear facilities.

The project TANDEM follows the recommendations of International Atomic Energy Agency (IAEA) to analyse the tsunami exposure of the nuclear facilities, as well as the recommendations of the French Nuclear Safety Authority (Autorité de Sûreté Nucléaire, ASN) in the aftermath of the 2011 catastrophe, which required the licensee of nuclear facilities to conduct complementary safety assessments (CSA), also including "the robustness beyond their design basis". The tsunami hazard deserves an appraisal in the light of the 2011 catastrophe, to check whether any unforeseen tsunami impact can be expected for these facilities.

TANDEM aims at defining the tsunami effects expected for the French Atlantic and Channel coastlines, basically from numerical modeling methods, through adaptation and improvement of numerical methods, in order to study tsunami impacts down to the interaction with coastal structures (thus sometimes using 3D approaches) (WP1). Then the methods will be tested to better characterize and quantify the associated uncertainties (in the source, the propagation, and the coastal impact) (WP2). The project will benefit from a Japanese cooperation (Meteorological Research Institute, MRI) to study in detail the coastal impact of the 2011 Tohoku tsunami (WP3). In this framework TANDEM will apply the models to the French study area, which includes investigating historical documents, defining the possible tsunamigenic sources able to strike the regions of interest (earthquakes and/or landslides), and modeling the coastal effects at a regional scale and for selected sites. Using high resolution bathymetric and topographic data in the frame of Litto3D (a French project whose main objective is to build a seamless integrated topographic and bathymetric coastal Digital Terrain Model), TANDEM will thoroughly investigate possible sources, through a detailed characterization of the slope stability off the coastlines (for the Celtic and Armorican margins, Bay of Biscay), and estimate the coastal impacts. It will also consider events (Canaries) whose assumed catastrophic impact has been widely discussed these recent years, needing a reappraisal regarding French coastlines. A special attention will also be paid to the estimation of the return periods expected for the tsunami scenarios.