# Hydro-agro-system of the wetlands in the Central Maya Lowlands: land use sustainability and the joint water management (hinterland of Naachtun, Petén tropical forest, Guatemala).

Cyril Castanet[*1], Amaury Fernandes[2], Aline Garnier[3], Marc Testé[2], Julien Cavero[4], Anne-Lise Develle-Vincent[5], György Sipos[6], Lydie Dussol[7], Louise Purdue[7], Eva Lemonnier[8], and Philippe Nondédéo[9]

[1]Université Paris 8 Vincennes Saint-Denis – Laboratoire de Géographie Physique, environnements quaternaires et actuels, LGP, UMR 8591 – France
[2]Université Paris 1 Panthéon-Sorbonne – Laboratoire de Géographie Physique, environnements quaternaires et actuels, LGP, UMR 8591 – France
[3]Université Paris-Est Créteil Val-de-Marne - Paris 12 – Laboratoire de Géographie Physique, environnements quaternaires et actuels, LGP, UMR 8591 – 61 avenue du Général de Gaulle - 94010 Créteil cedex, France
[4]Laboratoire de Géographie Physique, environnements quaternaires et actuels, LGP, UMR 8591 – Université Paris 1 - Panthéon-Sorbonne, Université Paris-Est Créteil Val-de-Marne - Paris 12 – France
[5]Environnements, DYnamiques et TErritoires de la Montagne, EDYTEM, UMR CNRS 5204 – Université Savoie Mont Blanc, LCME, F-73000, Chambéry-France – France
[6]OSL Hungary LTD, Department of Physical Geography and Geoinformatics, University of Szeged – Hongrie
[7]Laboratoire Cultures et Environnements Préhistoire, Antiquité, Moyen Âge, CEPAM, UMR 7264 – Université de Nice-Côte d'Azur – France
[8]Université Paris 1 Panthéon-Sorbonne – Laboratoire Archéologie des Amériques, ARCHAM, UMR 8096 – France
[9]Laboratoire Archéologie des Amériques, ARCHAM, UMR 8096 – Université Panthéon-Sorbonne, Université Panthéon-Sorbonne – France

### Résumé

In the Central Maya Lowlands, seasonal marshes (*bajos*) represent a significant part of the territory of Maya cities. Over the past decades, researchers had already suspected the strong exploitation of water and soil resources by the ancient Mayas, for intensive cultivation in these specific environments. But this assumption had never been firmly demonstrated in this area, because of the vegetal cover which limits large-scale surveys. In 2016, an airborne laser scanning of the Northern Peten (in the frame of Pacunam LiDAR Initiative) allows the study of the hinterland of several Maya cities. Among them, the survey of Naachtun's territory, a Maya regional capital of the Classic period (AD 150 – 950), revealed high densities

---

[*]Intervenant

of wetland features, such as canals, fields and reservoirs, detected in the *bajos*. In these new contexts, the unresolved questions of the land use sustainability and the joint water management are therefore asked again and the hydro-agro-system of the wetlands areas of Naachtun is being studied. Our methodology is systemic, multi-scale and interdisciplinary. The geoarchaeological approach relies on complementary works: LiDAR processing, spatial analysis, stratigraphy, sedimentology, geochemistry, pedology, paleoecology, geochronology, archaeology. These wetland features appear as the remains of hybrid – hydraulic and agrarian – infrastructures. The farming system based on agrarian structures of the *bajos* have been partially revealed (agrarian morphologies of raised and drained fields, cultivation systems). A first chronology of this hydro-agro-system of the *bajos* has been established. During the Preclassic and Classic periods, a large part of the *bajos* was exploited for intensive cultivation. The gain of arable land was significant. This intensified food production system contributed, with agriculture and agroforestry on the uplands, to the subsistence of urban, peri-urban and rural populations. Ongoing research explores the degree of resilience of this hydro-agro-system, in the face of climate forcing and of human factors.