Unmanned aerial vehicle observations of water surface elevation and bathymetry in the cenotes and lagoons of the Yucatan Peninsula, Mexico - DTU Orbit (03/11/2019)

Unmanned aerial vehicle observations of water surface elevation and bathymetry in the cenotes and lagoons of the Yucatan Peninsula, Mexico

Observations of water surface elevation (WSE) and bathymetry of the lagoons and cenotes of the Yucatán Peninsula (YP) in southeast Mexico are of hydrogeological interest. Observations of WSE (orthometric water height above mean sea level, amsl) are required to inform hydrological models, to estimate hydraulic gradients and groundwater flow directions. Measurements of bathymetry and water depth (elevation of the water surface above the bed of the water body) improve current knowledge on how lagoons and cenotes connect through the complicated submerged cave systems and the diffuse flow in the rock matrix. A novel approach is described that uses unmanned aerial vehicles (UAVs) to monitor WSE and bathymetry of the inland water bodies on the YP. UAV-borne WSE observations were retrieved using a radar and a global navigation satellite system on-board a multi-copter platform. Water depth was measured using a tethered floating sonar controlled by the UAV. This sonar provides depth measurements also in deep and turbid water. Bathymetry (wet-bed elevation amsl) can be computed by subtracting water depth from WSE. Accuracy of the WSE measurements is better than 5–7 cm and accuracy of the water depth measurements is estimated to be ~3.8% of the actual water depth. The technology provided accurate measurements of WSE and bathymetry in both wetlands (lagoons) and cenotes. UAV-borne technology is shown to be a more flexible and lower cost alternative to manned aircrafts. UAVs allow monitoring of remote areas located in the jungle of the YP, which are difficult to access by human operators.

General information
Publication status: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, National Space Institute, Geodesy, Amigos de Sian Ka’an
Corresponding author: Bandini, F.
Pages: 2213–2228
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Hydrogeology Journal
Volume: 26
Issue number: 7
ISSN (Print): 1431-2174
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 2.38 SJR 0.94 SNIP 1.335
Web of Science (2018): Impact factor 2.401
Web of Science (2018): Indexed yes
Original language: English
Keywords: Mexico, Karst, Groundwater/surface-water relations, Cenote
Electronic versions:
Hydrogeology_journal_last.pdf. Embargo ended: 11/04/2019
DOIs: 10.1007/s10040-018-1755-9
Source: Findit
Source ID: 2409520123
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review