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SATELLITE TECHNOLOGIES SOLVING WATER ISSUES IN AFRICA

Abstract

For forty years, satellites have provided information to understand the water cycle. The data collected by scientists is crucial to protect the oceans, seas, large lakes and all aquatic environments. The coverage of areas of interest becomes wide and regular as the satellites scan the entire African continental surface and frequently pass over the basins studied. All kinds of techniques and sensors are involved including satellites in orbit evolving at a few hundred or thousands of kilometers in altitude, geostationary satellites following the rotation of the Earth at 36,500 kilometers from its surface, observation techniques covering electromagnetism, from optics to microwaves. Using specific analysis methodologies, hydrologists now use data acquired by different satellites, passive sensors that record signals emitted by the Earth and active instruments that send a signal to our planet and record its reflection. By crossing data ranging from microwaves to infrared, from numerous satellites, active or passive, scientists are able to estimate precipitation in near real time. However, the use of satellites in no way disqualifies in situ observation and must therefore be considered complementary: the variables recorded in the field remain essential for validating and calibrating spatial data. Specialists are now working on the development of satellites specifically dedicated to surface hydrology, such as the French-American SWOT (Surface Water and Ocean Topography), the launch of which is scheduled for 2022. These calculation models, gradually developed over the decades thanks to new techniques, the explosion of computing capacities and the emergence of space remote sensing, aim to reproduce natural hydrological processes. The thousands of terabytes of hydrological data acquired and processed daily from satellites and in-situ networks are explored through digital programs to simulate the water cycle. In addition to scientific interest, the forecasts established by hydrologists have valuable applications for society and the environment such as optimization of water withdrawals, launching of dams, fishing, river navigation for users and managers of the resource, planning development for decision-makers and, more generally, the preservation of natural resources, environments and climate.