



Tracking Clouds with low cost GNSS chips aided by the Arduino platform

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The Global Navigation Satellite System (GNSS) is a constellation of satellites that is used to provide ge-positioning services. Besides this application, the GNSS system is important for a wide range of scientific and civilian applications. For example, GNSS systems are routinely used in civilian applications such as surveying and scientific applications such as the study of crustal deformation. Another important scientific application of GNSS system is in meteorological research. Here it is mainly used to determine the total water vapour content of the troposphere, hereafter Precipitable Water Vapor (PWV). However, both GNSS receivers and software have prohibitively high price due to a variety of reasons. To overcome this somewhat artificial barrier we are exploring the use of low-cost GNSS receivers along with open source GNSS software for scientific research, in particular for GNSS meteorology research. To achieve this aim, we have developed a custom Arduino compatible data logging board that is able to operate together with a specific low-cost single frequency GNSS receiver chip from NVS Technologies AG. We have also developed an open-source software bundle that includes a new Arduino core for the Atmel324p chip, which is the main processor used in our custom logger. We have also developed software code that enables data collection, logging and parsing of the GNSS data stream. Additionally we have comprehensively evaluated the low power characteristics of the GNSS receiver and logger boards. Currently we are exploring the use of several openly source or free to use for research software to map GNSS delays to PWV. These include the open source goGPS (<http://www.gogps-project.org/>) and gLAB (<http://gage.upc.edu/gLAB>) and the openly available GAMIT software from Massachusetts Institute of Technology (MIT). We note that all the firmware and software developed as part of this project is available on an open source license.