EVALUATION OF RELIABILITY AND USE OF DATA FROM SENSORS ON BOARD OF VEHICLES IN METEOROLOGY AND ENVIRONMENTAL OBSERVATIONS

Santana, Márcio A. A.[1], Almeida, Eugênio E.[1]; Guimarães, Patrícia L. O.[1], Sugawara, Luciana M.[1], Merlone, Andrea[2], Musacchio, Chiara[2], Coppa, Graziano[2]

[1] Instituto Nacional de Pesquisas Espacias (INPE), Brazil.

[2] Istituto Nazionale di Ricerca Metrologica (INRiM), Italy

e-mail: marcio.santana@inpe.br

Abstract: The implementation of meteorological databases from new data sources, including previously disregarded metadata, comes to fill some spatial, temporal and informational gaps in several applications involving environmental monitoring. Currently there is the WMO Integrated Global Observing System (WIGOS), which is a global network that provides essential data for meteorology and climatology. Among these observation systems are recommendations for mounting sensors in an Automatic Weather Station (AWS), including ideal conditions for measurements and how obstacles, such as trees and buildings can affect sensor readings. There are different technologies, technical and configuration specifications for the most varied meteorological data networks currently available. This article proposes a possible innovation in an environmental observation system through the use of sensors embedded in automobiles, specifically the On-Board Diagnostics (OBD) system, as a source of data collection for environmental and meteorological monitoring. OBD is an automotive diagnostic system that monitors the proper functioning of the vehicle's engine, transmission, and exhaust systems. It can be used as an innovative source of data collection, since environmental monitoring can benefit from the following data provided by OBD: geographic location, date/time, air temperature and atmospheric pressure. Collecting this information remotely can increase data availability in a short amount of time. Data and their metadata (sensor specifications, including measurement uncertainty), organized in a database, have the potential to assist in meeting the demand for environmental data in places where there is a lack of data from meteorological station networks and to improve the evaluation and validation of data through its metadata. Thus, this work describes a proposal for the structuring and availability of a meteorological database with metadados and the evaluation of the reliability of the information, based on measurements carried out by sensors embedded in vehicles. In this work, an atmospheric pressure sensor in the range of 500 hPa to 1100 hPa and an air temperature sensor in the range of -15 ^{o}C to +45 ^{o}C were calibrated, whose largest uncertainties of type A (k=1) were 0, 04 hPa and 0,004 ^{o}C. The measurement uncertainties expanded to a coverage probability of 95,45% evaluated ranged from 0,21 hPa to 0,22 hPa and from 0,14 ^{o}C to 0,58 ^{o}C. The greatest contributions of uncertainty were from the calibration systems (type B), that is, uncertainties can be lower using other calibration systems. Based on the collected and corrected data and the measurement uncertainties of the two sensors, it is proposed the development of protocols for comparisons with other environmental monitoring systems (weather stations and remote observational systems), use of Artificial Intelligence techniques for validation and qualifying data from vehicles, testing the use of data in meteorological models and using it in several other meteorological applications and climate studies. The involvement of the important automotive sector in the important activity of environmental monitoring has already become one of the great positive results of this project.