Abstract

Modelling of Transport of Air Pollutants from the Offshore Petroleum Industry of Trinidad

Xsitaaz Twinkle Chadee

This work entailed the development of the first coupled regulatory dispersion and meteorological model called the Regulatory Dispersion Model for Offshore Tropical Conditions (ReDMOTropiC), for determining the distribution of air pollutants arising from sources located in the ocean in a tropical environment namely the Caribbean Islands, and the investigation of the impact of sulphur dioxide emissions originating from the offshore oil and gas industry of the east coast of Trinidad on the internationally protected Nariva Swamp. ReDMOTropiC comprises of two distinct modules; a meteorological module which determines secondary parameters for marine tropical conditions, and a dispersion module which uses the computed secondary parameters to compute concentration distributions. ReDMOTropiC is applicable to homogeneous, stationary meteorological conditions.

ReDMOTropiC, used in its climatological mode, showed that for two offshore sources off the east coast of Trinidad, sulphur dioxide concentrations exceeded the standards for vegetation at all receptors in the Nariva Swamp for

both the dry and wet seasons. Monthly average concentrations were exceeded at all receptors for most months except for December 2000 and January 2001. 34% of the receptors exceeded the standard in December 2000 and 63% of the receptors in January 2000.

ReDMOTropiC determined short-term ground level concentration fields at specific locations (those mainly under greatest impact) when meteorological data over a period of a day was used. During daytime onshore flows fumigation effects are likely to be significant. Fumigation investigations using ReDMOTropiC in its short-term mode determined the locations (in terms of latitude and longitude) that were under greatest impact from the air pollutant emissions of the offshore oil and gas industry. Numerical simulations indicated that during the month of January 2001, fumigation effects were pronounced and ground level concentrations of SO_2 exceeded the hourly standard 47% of the time. ReDMOTropiC also contains modules for predicting concentration fields for point emission sources located on land. ReDMOTropiC may be used in the evaluation of air quality in and around the industrial areas of Trinidad.

Keywords: Xsitaaz Twinkle Chadee; offshore dispersion modelling; regulatory model; air pollution transport; ReDMOTropiC; tropics.