UNDERSTANDING THE INCONSISTENCIES BETWEEN TWO DIFFERENT SOURCES OF MORTON'S AAET DATA FOR RANGER URANIUM MINE SITE, NORTHERN TERRITORY, AUSTRALIA

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To understand the relationship between the climate and groundwater levels in shallow unconfined aquifers, the historical data of rainfall and evapotranspiration (Morton's Actual Areal Evapotranspiration, AAET) and groundwater level data have been analysed. The site studied is the Ranger uranium mine, Northern Territory, Australia. Of the three main hydrologic variables, rainfall and groundwater level data are measured whereas evapotranspiration data are estimated. As the process of evapotranspiration estimates involves a lot of climatic variables, which vary significantly in time and space, there was a need to investigate the available methods and sources for estimating evapotranspiration (ET) data.

The two principal sources of ET data are the Bureau of Meteorology ET map data and SILO Patched Point Data (PPD). The ET map of Australia is developed based on long-term averages (1961-1990) for the monthly values of a year. The SILO data provides daily values of estimated evapotranspiration. We select the AAET from both sources for our analysis. We estimate the monthly AAET of SILO data by summing up the daily values, with SILO data obtained in 2006 being for the period 1980-2005. Both of these sources have used the Morton equations in the estimation of AAET. We compare the annual AAET of these two sources in view of their performance in the annual water balance for the Ranger site.

The average annual Morton's AAET from SILO is 1414 mm whereas the AAET for the same site from the ET map gives 1064 mm. The ET map is based on the period of 1961 to 1990. Therefore we find the average annual Morton's AAET from SILO 2006 source for the Jabiru site for the same period (1961 to 1990) also and it is 1361 mm. Thus the SILO data source of Morton's AAET is consistently higher then the ET map. The consideration of annual runoff in the water balance fits better with ET map data in comparison to SILO; ie. Runoff (514 mm) + AAET (1064 mm) = Rain (1498).

Though both are ideally supposed to be the same estimates, the reason for inequality may be attributed to the fact that after estimation of AAET, the values of map were adjusted for the regional water balance by the investigators.

Therefore two sets of conceptual models need to be considered to demonstrate the validity of both of the AAET estimates. For AAET estimates of SILO, we should consider (Rain = wet season AAET + runoff) and (runoff = dry season AAET). That means, the runoff is a sink for wet season rainfall and source for dry season evapotranspiration in the form of soil moisture. This is valid where the catchments under consideration generates and absorbs the runoff within itself.

For AAET estimates from ET map data we should consider Rain = Runoff + AAET. This is valid when the runoff is a one-way flow; it is generated from rainfall and not absorbed within the catchments boundary for recycling in dry season.

In summary, it is critical to check and cross-correlate AAET data for hydrologic catchments, especially in the context of regional water balances.

Key words: Morton's AAET, SILO Patched Point Data, evapotranspiration map data, Ranger uranium mine

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