II-164 **On the Changing SC Response of the Kanedaira Catchment.**

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INTRODUCTION

The Specific electric conductivity (SC) of streamwater, an indicator of total ionic response, is a natural tracer used in many hydrologic studies. It has traditionally been used to calculate the old (pre-event) and new (event) water contributions of a storm hydrograph. Many of the published data for SC measurements, e.g. De Boer & Campbell (1990), Muraoka & Hirata (1988), Matsubayashi et al.(1993) etc., show the SC decreasing with the rising limb of the hydrograph and then recovering to the original level during the falling limb. Some other researchers including Gilham (1984) etc. indicate the phenomenon of rising specific conductivity during and after the discharge peak. It is impossible to apply the traditional hydrograph separation method to this type of catchments. In our experimental observations both these phenomena were observed and this short paper attempts to identify the reasons for this behavior.

The Kanedaira experimental catchment is located in the Southern Gifu prefecture. The catchment details are given in Matsubayashi et. al (1990). The top soil layer of about 1m deep is underlain by weathered granite. During the summer of 1995, the chemical behavior of the catchment was intensively studied during rainfall events, with the aim of establishing subsurface flow paths. Specific Conductance of the streamwater was one of the parameters studied in this research. The Specific Conductivity (SC) and temperature of the stream were automatically recorded and the SC values were standardized to a temperature of 25°C. The soil water tension data shown in the figure 2 were from a station 9m from river bank, at 10, 25, 50, and 100 cm depths.

OBSERVATIONS & DISCUSSION

The streamwater discharge and SC behavior are shown in the Figure 1. The rain and tensiometer data for two typical rain events is given in Figure 2. Table 1 shows the rainfall data for four rain events. It is evident that events 1, 2, and 4 are events with low antecedent rainfall, while event 3 has high antecedent rainfall. When we look at the SC behavior, it can be seen that the stream SC shows rising tendency for initially drier conditions, and decreasing tendency for high antecedent rains. The atmospheric inputs of SC (from the rainfall) is quite lower than stream SC and it cannot explain the variation of stream SC with rain peak.

In this catchment, no surface runoff was found during the storms, but the stream response to the rainfall was almost immediate. Since no surface flow was evident, the contribution to the discharge peak might have come from the subsurface flow. If the subsurface flow was fast flow (macropore type), the SC and isotopic data should show the contribution of new (event) water.

Matsubayashi et. al (1990), based on $\delta^{18}O$ tracer observations concluded that more than 80% of the direct runoff in this catchment occurs as the outflow of groundwater and the volume of new water in the quick flow can be accounted almost entirely by the channel precipitation and near stream saturation overland flow. This is contradictory to the traditionally held view of a runoff model.

The rise of SC can be attributed to the flushing out of water which had been in storage for a longer time, and having a higher SC. This supports the observation that the stored water is the predominant outflow during rainfall, and the inversion of SC in the rain event 3 reflects the effect of different contact times between stored water and soil matrix.

Figure 2 shows the response of the tensiometers to the rain events 1 to 3 respectively. The tensiometer data shows that the surface layers immediately respond to the rain input while the behavior of the lower layers is more dependent on antecedent rainfall. For rain event 1, with initially drier conditions, the hydraulic gradient is more favorable to vertical infiltration while for event 3, the bottom layers are nearly saturated, and the hydraulic gradient is more favorable for lateral flow to occur. The lower SC in the event 3 may result from the shorter flow path (hence the shorter contact time with soil) thus resulting.

In conclusion it can be said that the stream SC behavior is affected by the antecedent rainfall. Also the SC data supports the observation that major contribution of the hydrograph comes from the volume of old water displaced from the stored water due to the rainfall input.

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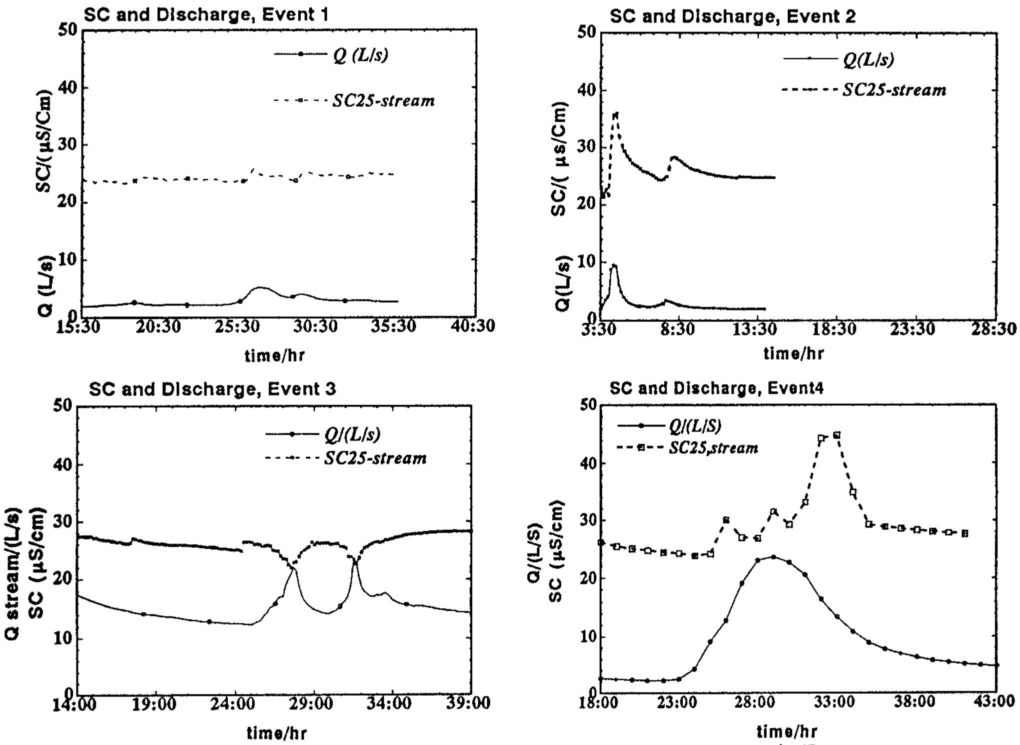

Figure 1: Stream Discharge and SC Behavior for Four Rain Events

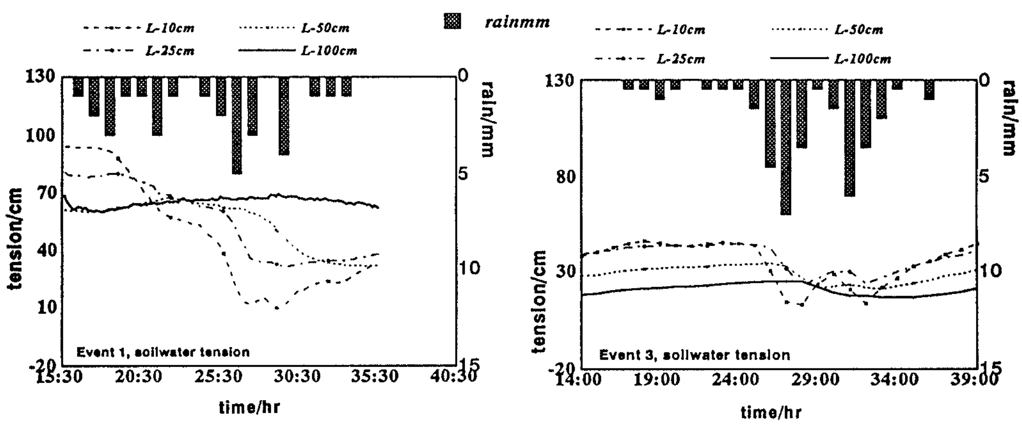

Figure 2: The Soil Water Response for Rain Events 1 & 3

Table 1: Data for the Rain Events

Rain Event	Total rainfall	Max. rainfall intensity	Previous rainfall within 10 days	∑ Pi/i (mm/day)
Event 1	22 mm	5 mm/h	28 mm	6.2
Event 2	16.5 mm	10.5 mm/h	8 mm	2.4
Event 3	35.5 mm	6 mm/h	162 mm	106.5
Event 4	76 mm	15.5 mm/h	31 mm	20.0