

Category: Natural Hazards (NH2)

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Preferred Mode of Presentation: Poster

Runoff Characteristics in Miyakejima Volcanic Island erupted in 2000, JAPAN

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The 2000 volcanic eruption in Miyakejima Island drastically changed hydrological conditions by depositing fine volcanic ash. Few sediment related disasters had been reported in the island before the eruption. However, intensive rain, soon after the eruption, triggered number of serious mudflows giving damages to infrastructures and houses. Now that more than three years have passed since the 2000 eruption, the rivers show different runoff responses to rain, sediment-discharge rivers, muddy-water-flushing rivers and calm rivers. In order to study the relation between rain and runoff, we installed four rain gauges and water level sensors in the eight rivers (Figure 1). The measured water levels were converted into the discharges with the measured cross-sections at each measuring point and the estimated roughness coefficients. Runoff ratios (f) were calculated by the following equation (1):

$$f = \frac{V}{A \cdot P} \quad (1)$$

in which V is accumulated discharge in volume, A is watershed area and P is precipitation in the period measured by the representative rain gauge.

Consequently, rivers located northern and eastern directions showed high runoff ratios while rivers in other directions showed relatively low (Figure 2). Reasons were discussed with the effect of volcanic ash deposit, the particle size of the tephra, riverbed conditions and so on. In conclusion, the reasons why rivers except northern and eastern rivers showed low runoff ratios are 1) smaller area is affected by fine volcanic ash which contributed to decreasing permeability, 2) particle size of tephra deposit was large at western watershed, 3) scoria deposit at the riverbed disturbed to generate runoff at southern watershed, while rivers of northern and eastern directions exposed lava at riverbeds seemed contributing less conveyance loss.

Keywords: Volcano; runoff ratio; water level sensor; rain gauge

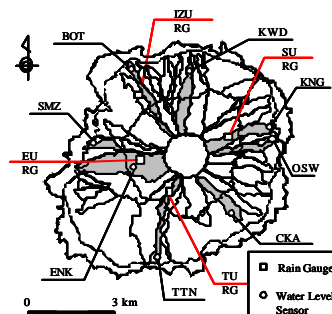


Figure 1. Location of rain gauges and water level sensors in Miyakejima volcanic island, Japan

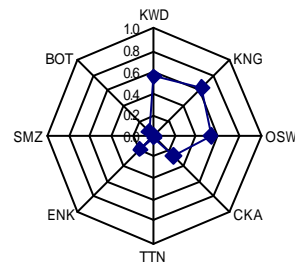


Figure 2. Runoff ratios of 8 rivers observed on 20-22 September, 2003