Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06155, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06155
EGU General Assembly 2008


# Experimental studies of the effects of pipe pressurization on outflow in artificially drained catchments.

**H. Henine** (1), Y. Nédélec (1), C. Kao (2), B. Augeard (1), F. Birgand (1) and C. Chaumont(1).

(1) Cemagref, Hydrosystems and Bioprocesses, Antony, France (2) AgroParisTech, Paris, France (hocine.henine@cemagref.fr / Fax: +33 1 40 96 62 70 / Phone: +33 1 40 96 62 60 )

In France, subsurface drainage concerns nearly 3 million hectares, which represent 10% of the agricultural surface. In waterlogged soil areas, it covers the main proportion of the catchment, up to 80% in the agricultural Brie area, East of Paris, France.

Artificial drainage effects on catchment outflow as well as landscape functioning were studied by several authors. The study of the impacts on downstream floods is complex because it has to cope with many physical parameters and three different scales: (i) the individual drained field scale where the discharge partly depends on both the water table height above the drains and the water pressure head in the drain; (ii) the drainage network scale for which all drained fields are linked to one single outlet, and several observed internal processes, exceeding design criteria, induced a pressurized flow in the drainage system; (iii) the stream catchment scale where the drainage outflow is potentially influenced by the river level and where surface runoff may also add complexity to the generation of flood.

This work focuses on experimental studies carried out at two small catchments, Mélarchez, 7.1 $km^2$ and Goins, 1.3 $km^2$, both located in the Brie region. The main objectives are to assess the drainage discharge as influenced by temporary field storage and overpressure in the pipe system, during intense rainfall events. At Mélarchez, the catchment outlet and one of the drainage networks, covering an area of 80 ha, were

monitored to identify the relationship between outflow and temporary storage when the drainage network gets pressurized. At Goins, discharges from the catchment outlet and one drained field, (1.7 ha and located at the downstream part of the network), were measured, to compare total catchment's outflow and drainage discharge from this field during pipe pressurization. A piezometric profile was recorded simultaneously to investigate storage in the water table.

Pressurized flows in the drainage network at Mélarchez site were observed when the drainage pipe's outlet becomes totally submerged in the arterial drainage channel. The specific flow rate measurements showed that the outflow from the drainage network was reduced compared to the outflow at the catchment's outlet, and remained constant throughout the period of pipe pressurization. The drainage peak flow was reduced of approximately 40%. Goins site field observations showed that, during periods of pressurized field collector, the drainage discharge was stopped and the infiltrated water was then temporarily stored within the field soil.

These experiments support that the hydrological effects of pressurized pipe flow condition may be related to temporary storage in whole drainage system from pipes to water table, and lead to reduced peak flows at the outlet of the catchment.