



## **Feedback of non-intrusive technologies to measure discharge in real time: Velocity radar station and velocity video station**

Gilles Pierrefeu, Xavier Martin, Grégoire Naudet, and Karine Delamarre  
Compagnie Nationale du Rhône, (g.pierrefeu@cnr.tm.fr)

CNR manages a hydrometric network with about 120 discharge stations. Most of them use rating curve to estimate discharge. CNR faces problems in case of a non-unique relation between level and discharge. This may for example happens just upstream the dams or hydropower. In 1993 CNR started to install some ultrasonic stations as transit time technology or Hadcp. They give good results but the maintenance may be difficult and often expensive. For these reasons, CNR has been looking for non-intrusive technologies and has installed some radar velocimetry or video stations.

Since 2012 CNR has installed six velocity radar stations to measure in real time the discharge in the Rhône River or its tributaries. CNR also installed two video stations on tributaries at the end of 2017.

The installation of a velocity radar is quite easy from a bridge. It works well and by all-time even by night or in bad weather conditions. The discharge time series given by the velocimetry radars are very similar to the gaugings or to the discharge time series of upstream stations estimated from other technologies. One of the main problems is that the wind can modify the surface velocity wich is thus no more representative of the mean velocity of the flow. However this effect may be more or less important depending on the flow. Most of the time, for high flows, this wind effect is small compared to the water surface velocity. Three of our stations work well all the time because there are protected from the wind. The three others give bad discharge values for small flow.

The other technology is measurement by video. Its main advantage is that it can be installed on a bank, a bridge is not necessary. The other advantage is that it measures the surface velocity over the entire width of the river, which is not the case of the velocity radar. However, the problem is that by night, in rainy or foggy conditions, the station doesn't work properly and the wind effect is the same as for the radar station. The first measures made in 2018 by our video stations seem really promising.