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SERVICE DE GEODESIE ET NIVELLEMENT

TRAVAUX SPECIAUX

SPECIAL SURVEY

OF

THE "VIADUC DE VERRIERES"

In July 2000, the Department of Specials Works of the French national mapping agency, the "Institut Géographique National", was requested to make a survey on the under construction Verrières viaduct near Millau, France.

The viaduct has a curved roadway, built by welding elements step by step. When the length of new added roadway is long enough to reach the next pier, the roadside is pushed to its new position. This operation lasts two days to join the two main piers. The aim of the survey was to give real time co-ordinates of 3 points of the roadway during the operation.

WHERE



Results for Point P4

WHAT



The photography (on the left side) shows the element of the viaduct's deck that will slowly move forward to reach the pier shown on the view right side. The operation was planned between the 26th and 28th July 2000.

HOW

On the deck: 3 points

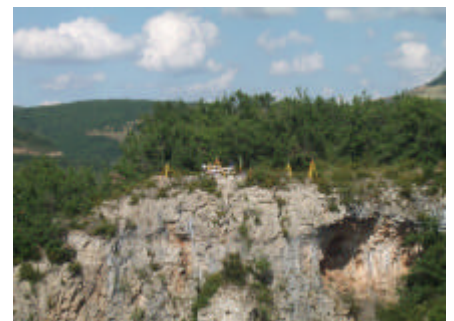


View of point n° PT32

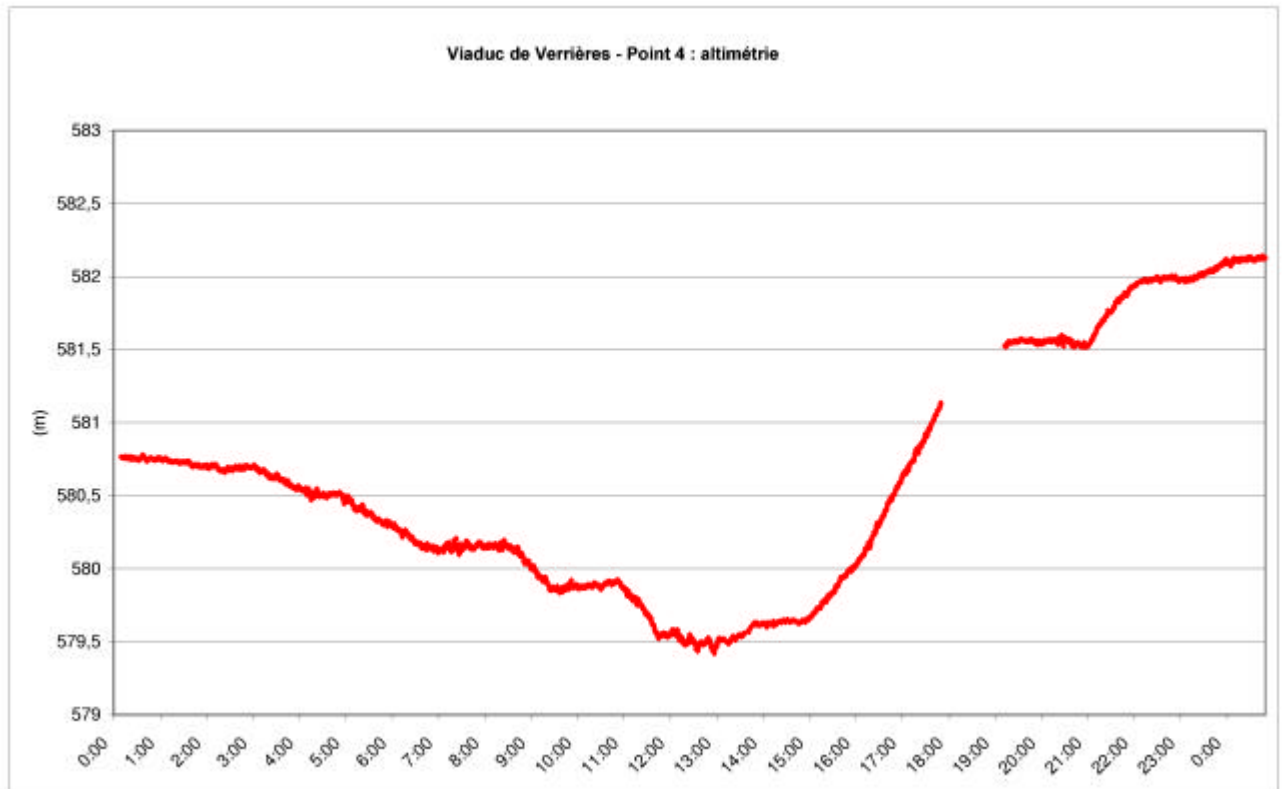


Point n° BAS1

Outside the deck: 3 points



View of the basis points



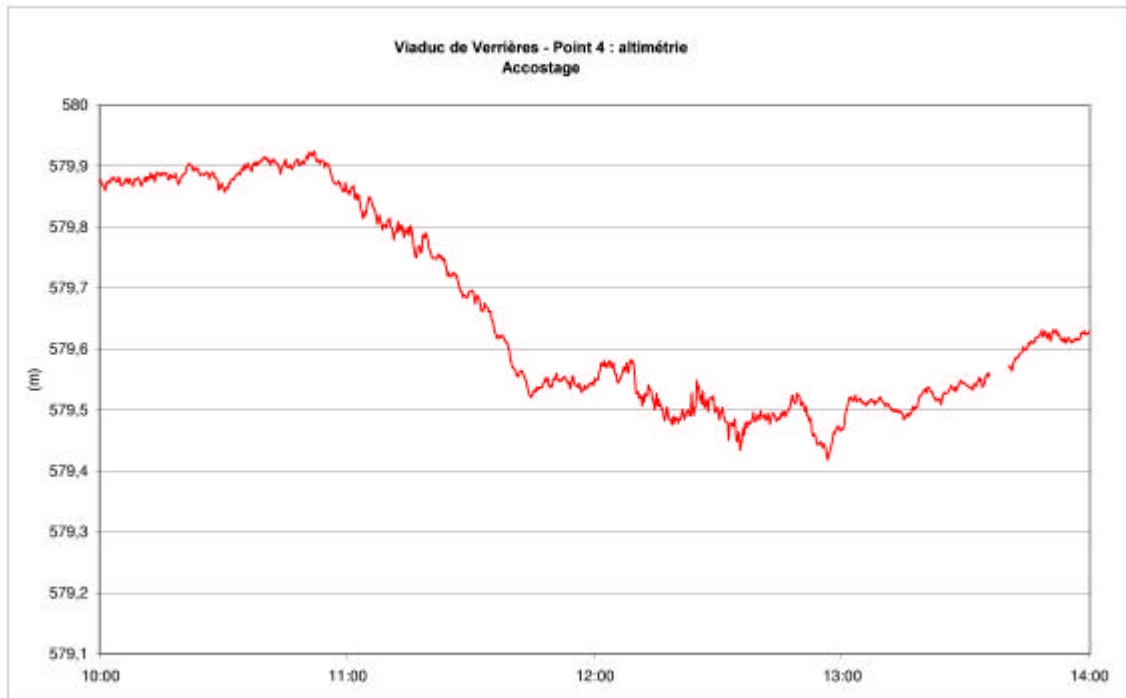
This graph shows the altimetric variation of point P4 during all the operation. This point is 4 meters back from the end of the structure.

We can see:

- different steps (ex: 9th and 11th hour of the total duration) corresponding to modifications of the configuration of the portico supporting the whole moving structure.
- The reaching of the pier about the 13th hour.
- The consolidation of the junction until the end of the operation

The hole in the graph is only a lack of data recording but on the field we have got the position of the point "in real time" all along the operation.

Results for Point P4 : zoom on altimetry

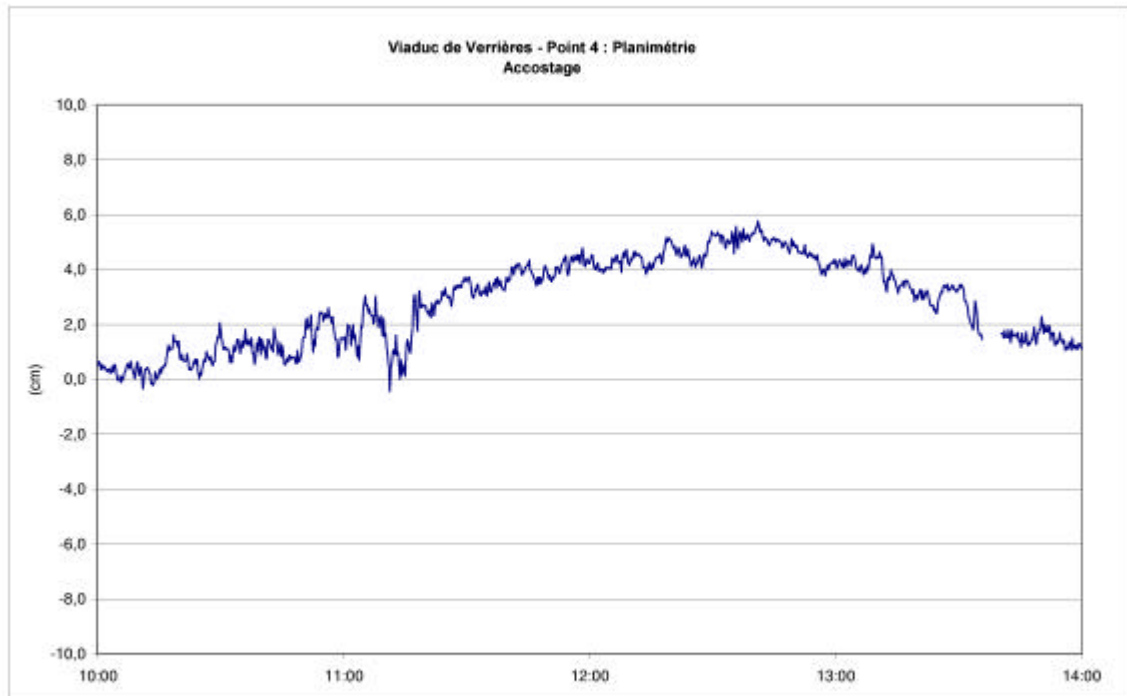


This part of the global graph shows more precisely the variations around the period of the pier reaching.

We can see small variations, for about one hour, around the lowest position (579.5 m) and then the beginning of the rising for this point.

Post calculation and comparisons with classical topometry show that we kept all along the operation an accuracy better than 2 cm.

Results for Point 4 : zoom planimetry



This graph represents the variations of the difference between theoretic and real planimetric position during the reaching of the pier, the same period as the altimetric position graph.

We can see a good arriving (10th hour), then a little deviation (12th hour) and in the end, the coming back to the aimed position when reaching the pier.

Post calculation and comparisons with classical topometry show that we kept all along the operation an accuracy better than 2 cm.

INTEREST

Advantages:

- The results (planimetric and altimetric information) are given in real time
- The accuracy is similar as if conventional topometric solutions were being used. But this solution is also available for larger bridges, or greater objects, where conventional technique is much less accurate.
- GPS technique is also available at night where there is less influence of temperature.
- In the same way, it is possible to do this kind of operation with rain or fog
- Generally speaking, this solution offers much more measurements than in a classical way, which can be very useful for engineering studies.

Drawbacks

- The most important drawback is the general problem of GPS: masks.
- Another (little) handicap is the reliability of the radio transmission

EVOLUTION

Improvements are possible and at the time being we are especially working on the following items.

- First we have to synchronise all our receivers with one unique clock, to improve the accuracy
- The second point is that we can't really estimate the effect of multipaths phenomenon. We have now to test different solutions to solve this problem
- Another point is that the material we use at the moment needs one master receiver for one mobile receiver. It's obvious that the operation would be much easier to settle if we used only one master for several mobiles.
- The next important step for this kind of operation is the automation of the system to have servo control of the unit moving the deck.

PERSPECTIVE: "VIADUC DE MILLAU", PROJECT

