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Using aerial photographs to analyse channel changes in large gravel-bed rivers: potential and limitations

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Channel changes of several large gravel-bed rivers in north-eastern Italy have been analysed in the short and medium-term, by an extensive use of aerial photographs. It turned out that aerial photographs are a very powerful tool for the study of such rivers, but also that more efforts are needed to assess their limitations (temporal and spatial resolution). Therefore, besides presenting the results of our studies, the aim of this paper is to discuss the potential and limitations of aerial photographs.

As for the medium-term (last 50 years), channel changes have been analysed using from a minimum of 4 to a maximum of 9 aerial photographs taken in different dates. Channel width, braiding intensity and channel sinuosity have been measured. Remarkable changes of channel width have occurred, in particular from the 1950s to the 1980s. Width decrease was of the order of hundred metres, from a minimum of 140 m (Torre Torrent) to a maximum of 610 m (Tagliamento River). Spatial resolution is not a limiting factor in this case since width variations are much larger than photograph resolution (pixel dimension was commonly of 1 m) and errors due to co-registration of photographs and digitalisation. On the contrary, some limitations do exist as for temporal resolution, which is determined by photograph availability.

As for the short-term, different potential and limitations of aerial photographs were found. For instance, temporal resolution can be increased, up to analyse channel response to single flood events, using commissioned flights. In this case, the spatial resolution of the photographs and errors due to co-registration and digitalisation may become limiting factors. In fact the magnitude of changes produced by small flood

events (e.g. bank retreat of few metres) can be comparable to errors associated with measurements. Some of the strategies to improve the spatial resolution in the short-term analysis are: use of large scale photographs, use of large scale maps as base layer and of ground targets for co-registration, use of specific protocol for digitalisation.