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COEVOLUTION OF RELIEF AND LANDSLIDES ON A VOLCANIC LANDSCAPE*



The basin of Puy-en-Velay, Massif central, France

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CONTEXT AND PHILOSOPHY OF THE RESEARCH

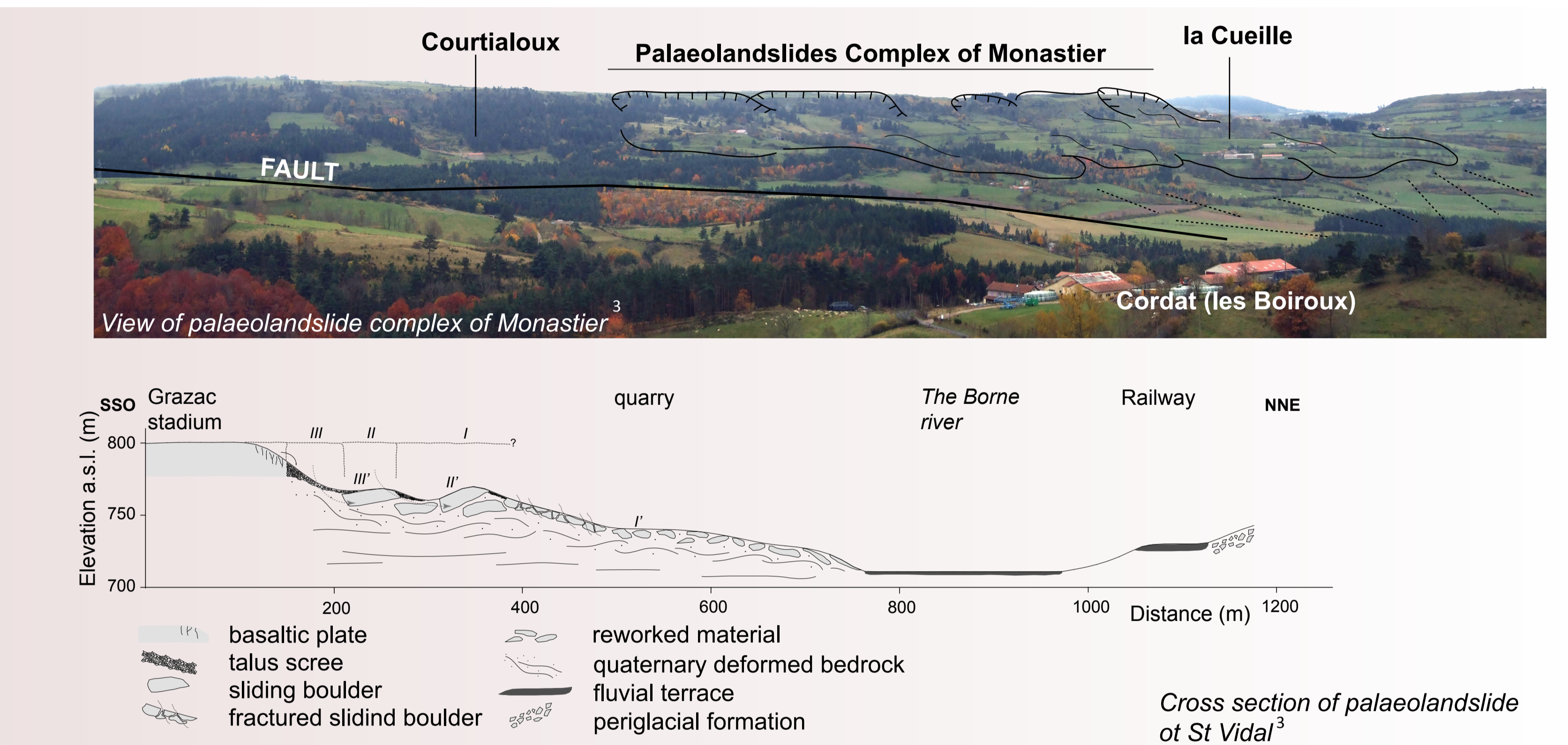
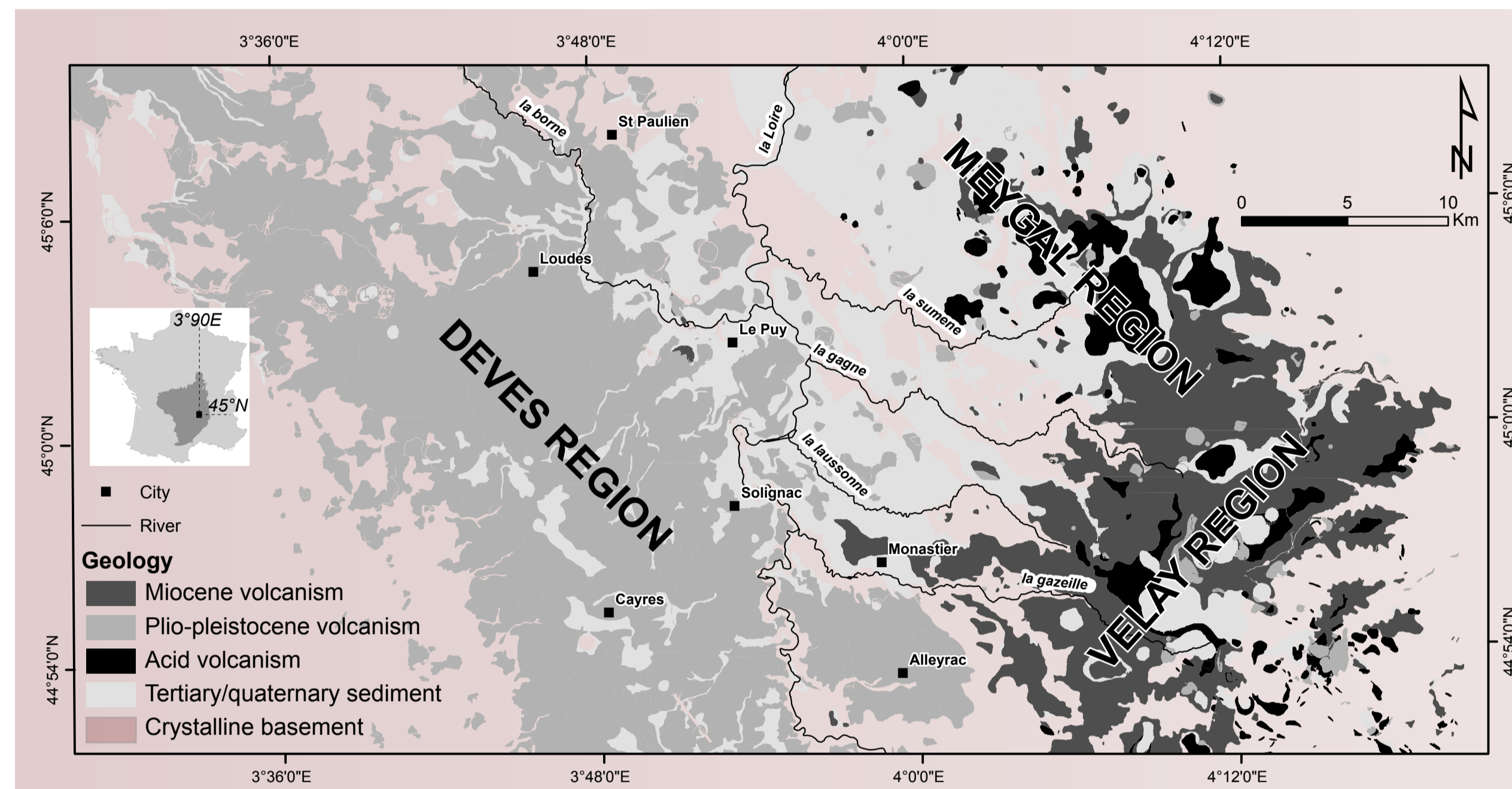
- . 20 years ago, the symposium "Morphogenic rythms in Volcanic Domain" at Clermont-Ferrand
- . PhD Thesis about the landslide hazard mapping in the basin of the Puy-en-Velay (Massif central, France)
- . Linking the temporal short scale of engineering geology with the temporal long term of relief evolution

HOW VALLEYS AND LANDSLIDES EVOLVED TOGETHER ?

METHODOLOGY

- . Morphometric analysis of 19 palaeolandslides
- . Morphometric analysis of 22 watersheds by mean of multivariate statistics (PCA and HAC)
- . Dating of basaltic tables as a chronological indication of the beginning of a new erosion cycle (bibliography)

STUDY AREA AND PALAEOLANDSLIDES



Tertiary basin with sandy clay material

Two volcanic phases¹:

- 1- Miocene => VELAY REGION
2. Plio-pleistocene => DEVES REGION

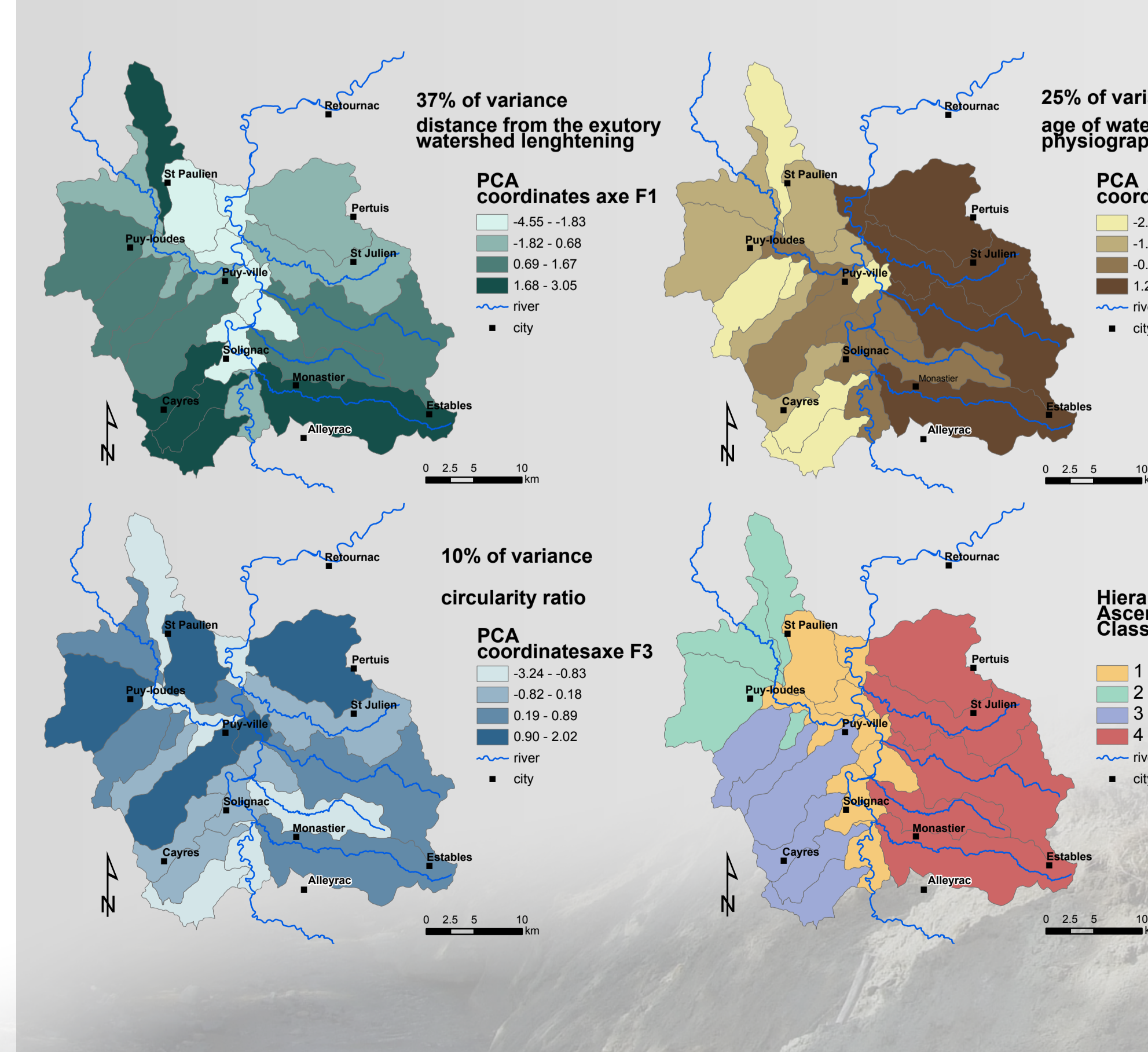
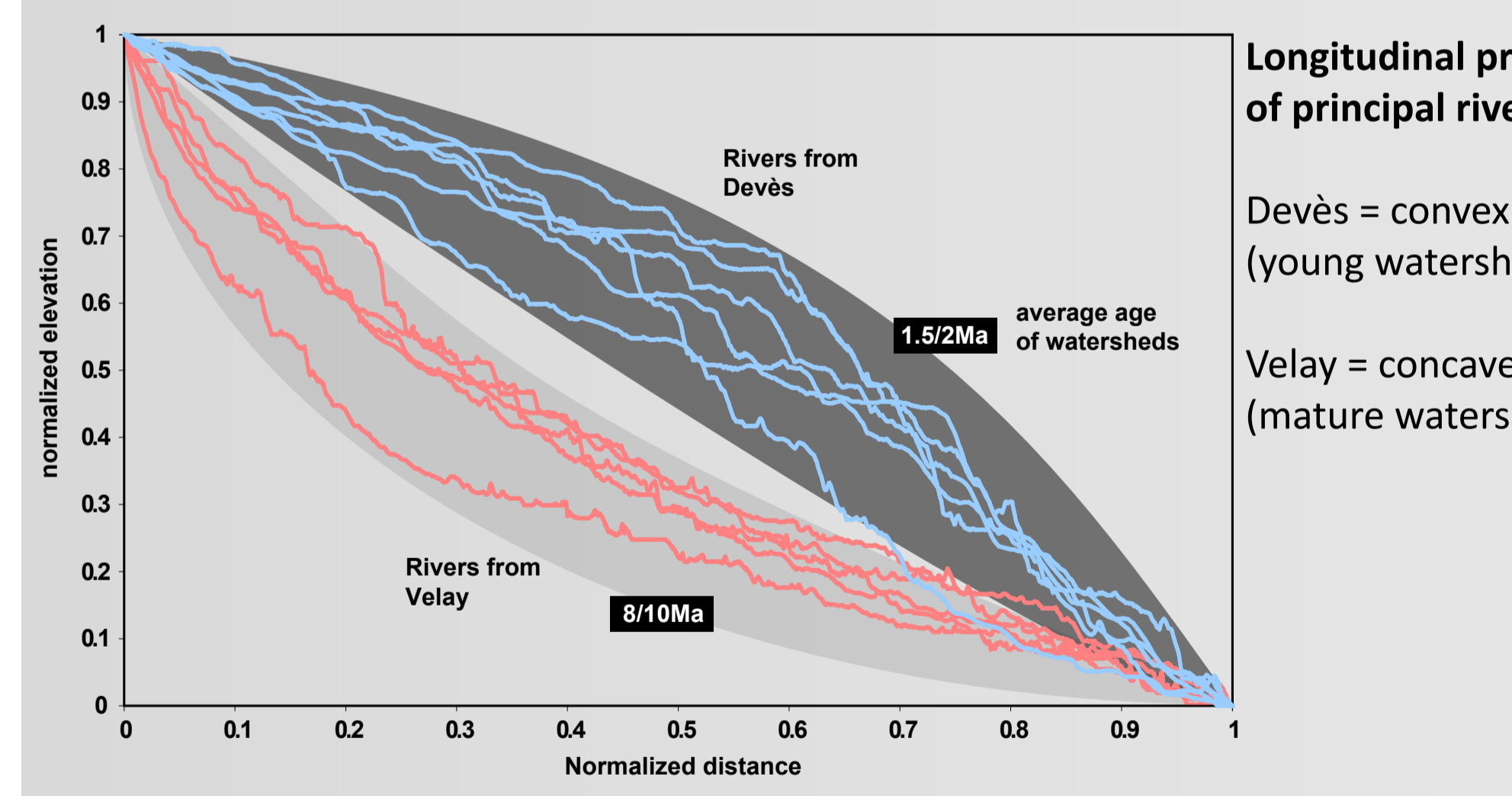
Rapid uplift during Pliocene with a great incision of hydrographic network²

**RELIEF INVERSION
 OVERSTEEPENING**

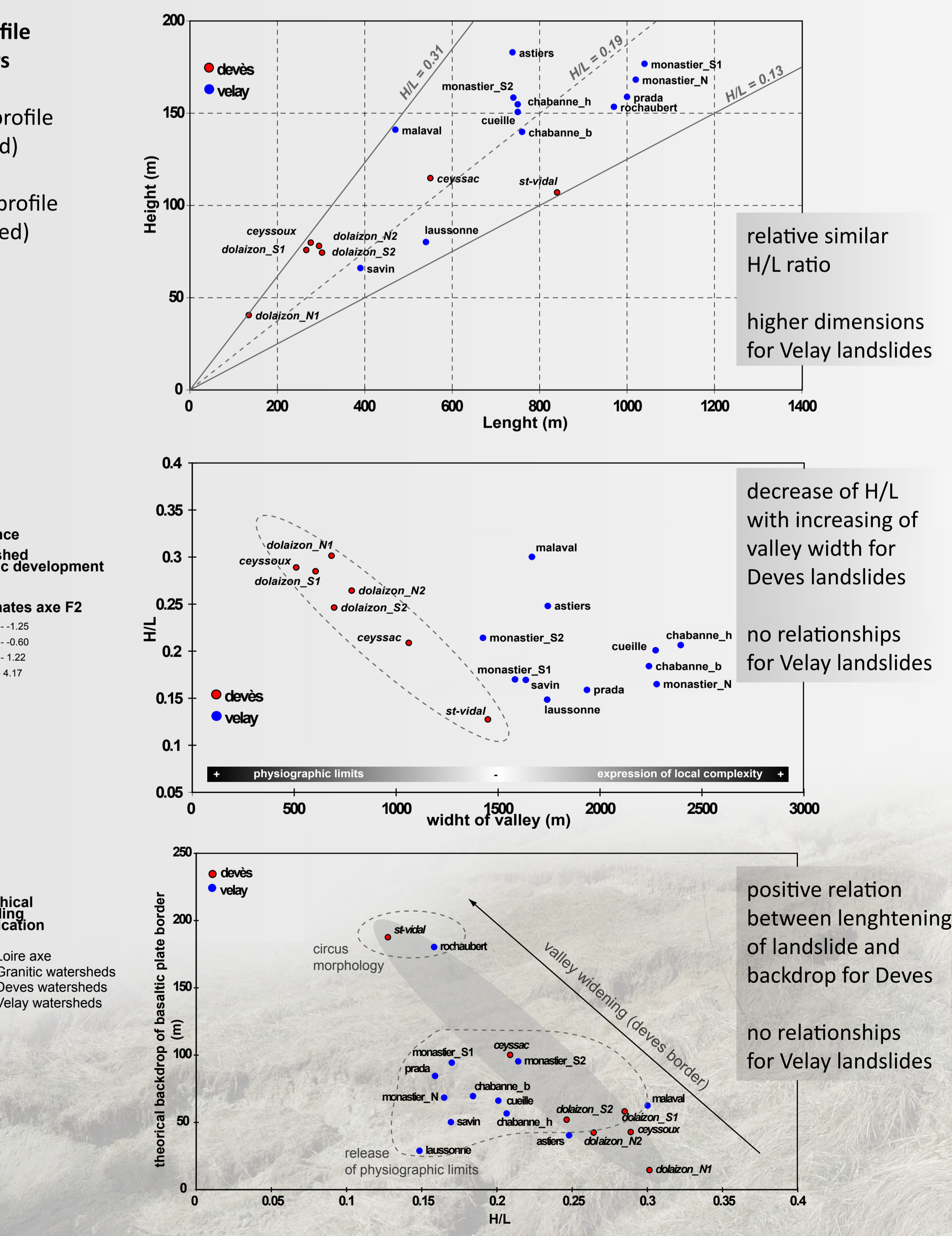
HUGE COMPLEX LANDSLIDE
 Initiation and reactivation during the Pleistocene and Holocene

RESULTS AND INTERPRETATION

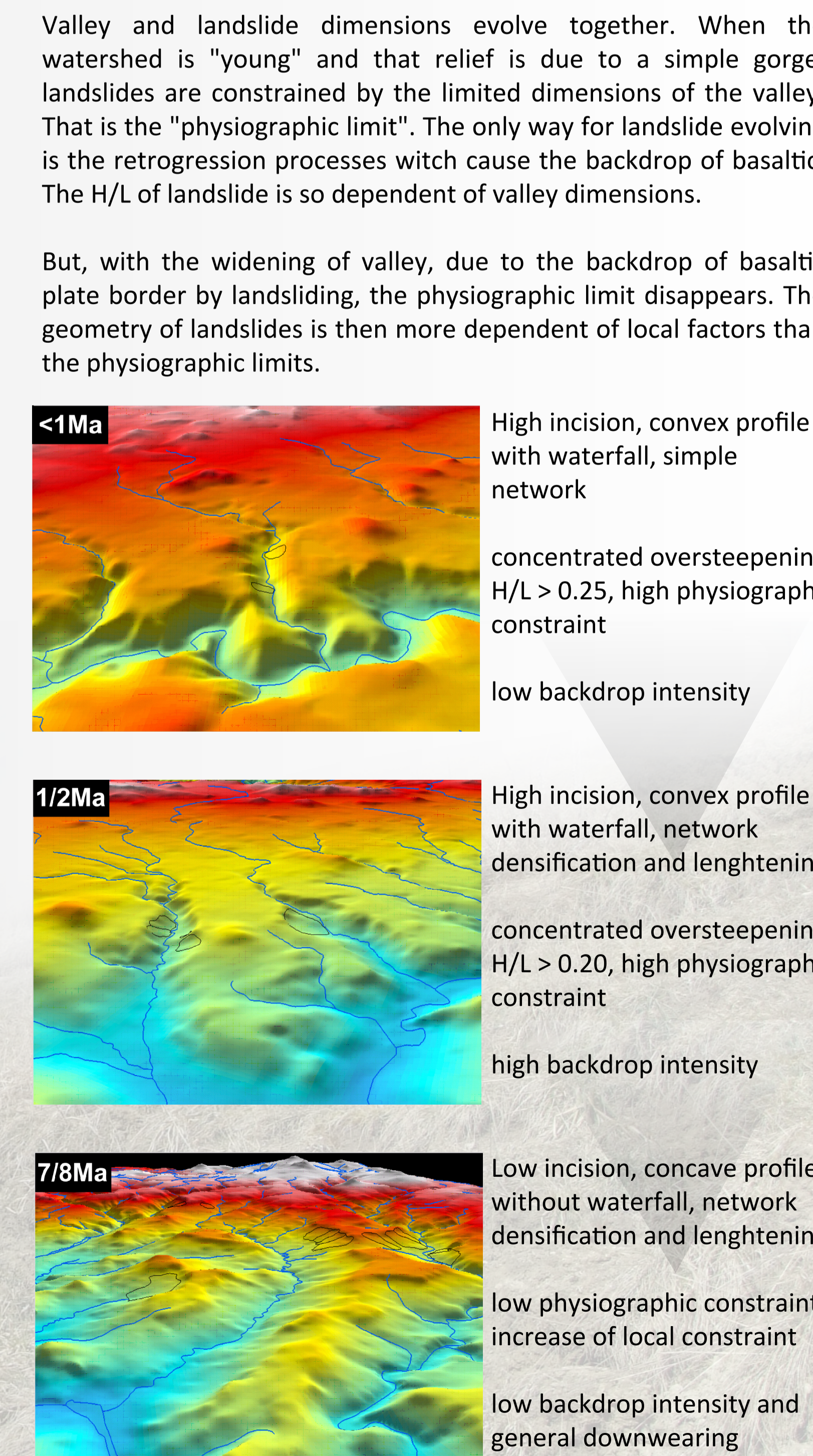
1 the morphometric difference between Deves and Velay



2 morphometry of palaeolandslides and relationship with valley dimensions



3 Interpretation and theoretical model of coevolution



Acknowledgement: Thanks to Emmanuelle Defive for the numerous discussions we had on the topic.

* in reference to A. Jefferson, G.E. Grant, S.L. Lewis and S.T. Lancaster (2010) - Coevolution of hydrology and topography on a basalt landscape in Oregon Cascade Range, USA. *Earth Surface Processes and Landforms*, 35, 803-816

1 - Mergoil J. and Boivin P. (1993) - Le Velay, son volcanisme et les formations associées : notice à la carte au 1/100000. *Géologie de la France*, 3, 96p.

2 - Defive E. (1996) - L'encaissement du réseau hydrographique dans le bassin supérieur de la Loire - contribution à l'étude des rythmes d'évolution géomorphologique en moyenne montagne volcanisée. Thèse de doctorat, Paris I, Panthéon-Sorbonne, 551 p.

3 - Poiraud A. and Defive E. (2011) - Morphology and geomorphological significance of relict landslides in the Tertiary basin of Puy-en-Velay (Massif Central, France). *Géomorphologie : relief, processus, environnement*, 3,