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INTERBEDDED HISTORY OF HOLOCENE TUFA AND ALKALINE PEAT FORMATIONS IN THE MIDDLE SOMME VALLEY (FRANCE)

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During the Holocene, concomitant formations of calcareous tufa and peat are recorded in the calcareous basins of north-western Europe (Belgium, the Netherlands, Germany, Poland). Since the 19th century, geologists have recorded tufa-peat formations in the middle Somme valley (France). Remains of Bronze Age swords in the upper part of the tufa suggest a minimum age for the deposit. However, the nature of these tufas (fluvial or spring) and their relationship to the alkaline peat was still poorly documented. Their exact geographical distribution in the valley was also unclear.

What is the distribution of Holocene calcareous tufas in the middle Somme valley?

What does the interbedding of tufa and peat suggest about the evolution of the valley during the Holocene?

Methods

1) Location and geometry of the tufas:

Stratigraphic survey (67 auger coring from 1 to 2 m depth) in a 2.5 km² area near Bourdon, compared with a GIS study (geological maps and DTM) of the entire middle valley floor.

2) Chronostratigraphy of two tufa-peat alternations:

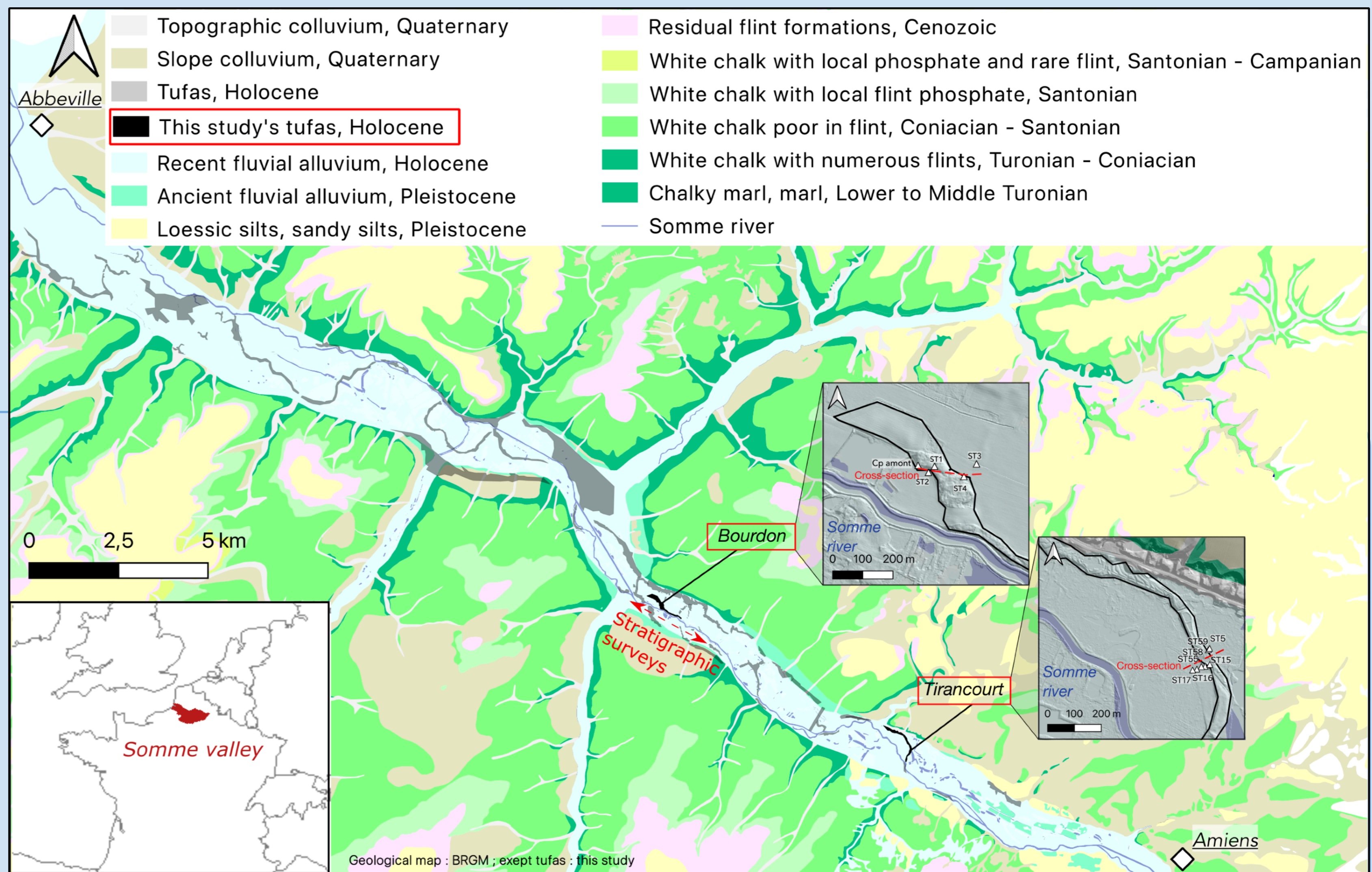
- Bourdon : cross-section based on 4 boreholes and a stratigraphic section;
- Tirancourt : cross-section based on 7 boreholes.

First results

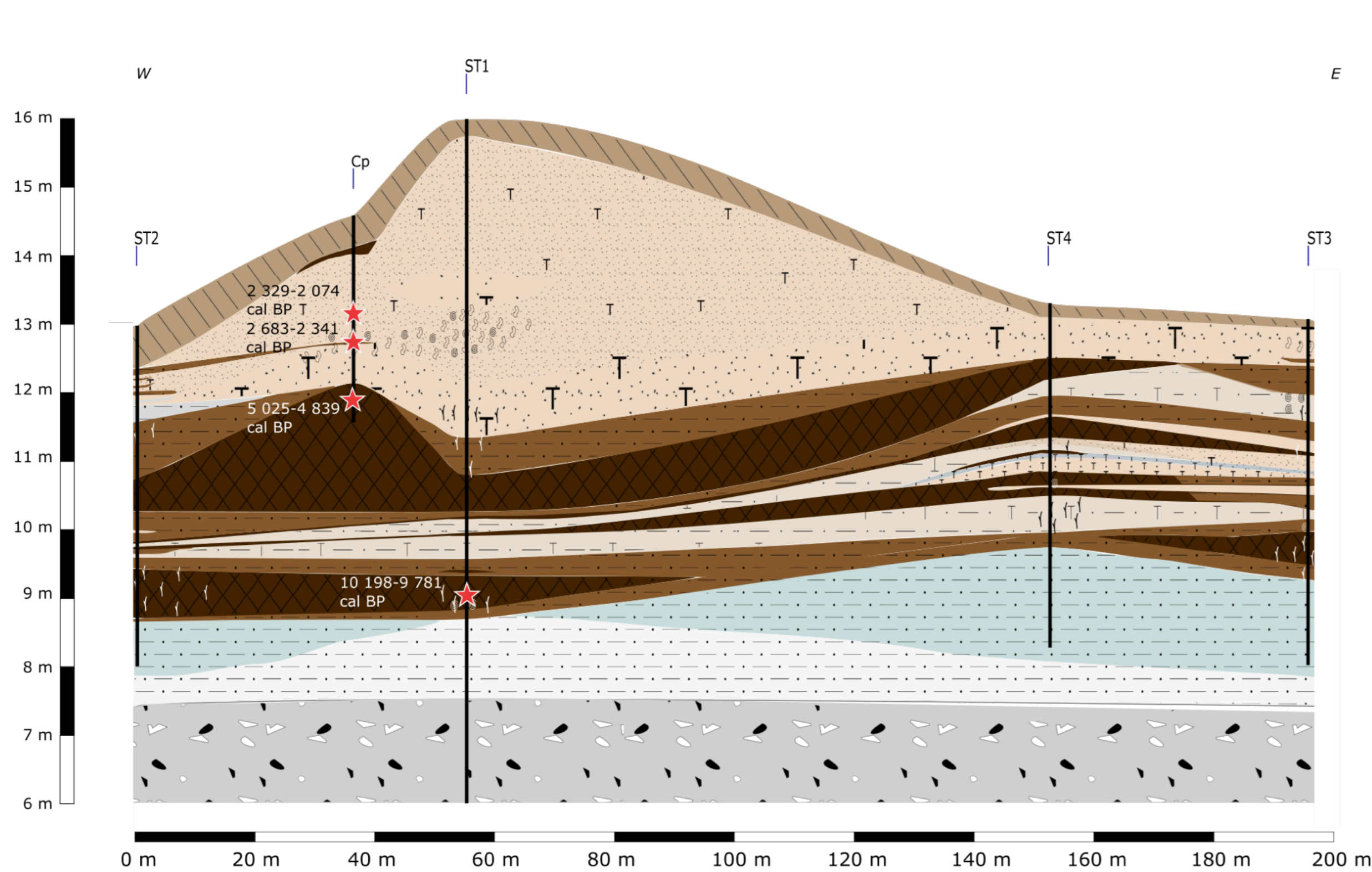
1) Location and geometry of the tufas:

In the midst of the peat deposits, the **tufas** are located 1) in in **topographic bulge** sometimes extending over several kilometres (e.g. : **Bourdon** and **Tirancourt**), which wind through the valley floor and 2) in **lateral banks** at the bottom of dry valleys. The morphology of the tufa's topographic bulges indicates that they were formed in a **paleochannel**, while the lateral-bank tufas suggest **water inputs from dry valleys**. The altitude of both is higher than that of the Somme waterlevel, suggesting a **higher water table** than is actually observed.

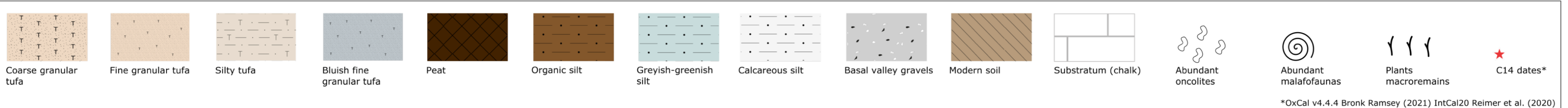
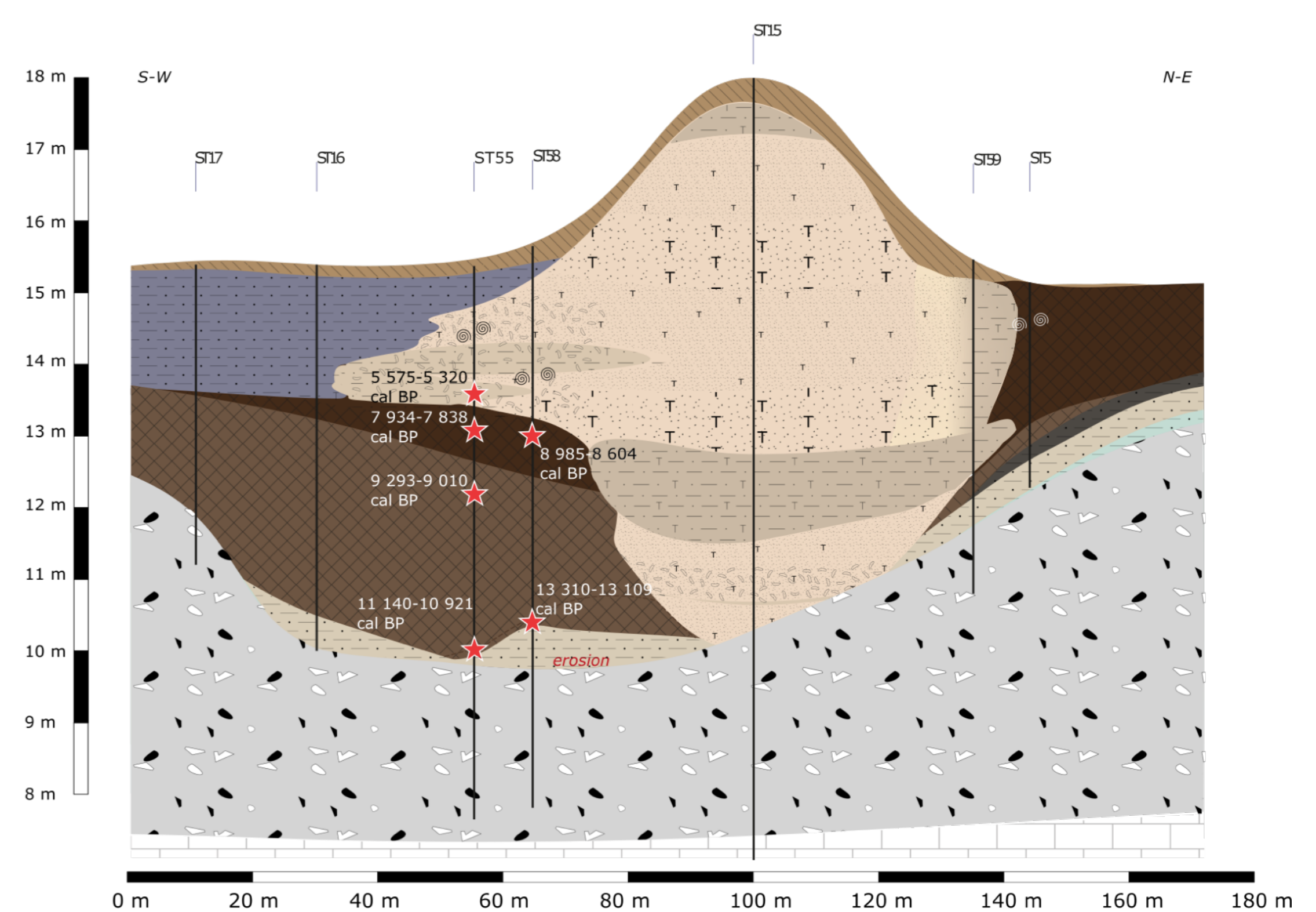
2) Chronostratigraphic evolution of two dome tufas:



Bourdon



Tirancourt



At **Bourdon**, the stratigraphy shows **5 main stages of sedimentation**. **1) Peat** on top of silt and basal valley gravels until at least 10 198-9 781 cal BP. **2) Silty tufa interbedded with peat and silt** : elevation on the stream level. **3) A second episode of peat** : lowering of the river level. **4) Coarse tufa with dam** : more intense river flow. **5) Fine-grained tufa** : decrease in the flow of the river. From 2 683-2 341 to 2 329-2 074 cal BP, the **oncolithic facies** on the river side of the tufa dome indicates an intense river flow on that side. Today, there is **no more active tufa**.

The overall profile of the **Tirancourt tufa** does not show the same morphology, **5 main stages of sedimentation** have been recorded. **1) Both tufa and peat** (from 13 310-13 109 cal BP to 7 934-7 838 cal BP) overlay the basal valley gravels. The **tufa is fine-grained to silty**. This indicates a low fluvial velocity, except for one **oncolithic level**. Peat is then no longer present. **2) Coarse-grained tufa** : increase in river flow. **3) From 5 575-5 320 cal BP, fine-grained tufa** : decrease in river flow. An **oncolithic facies** on the river side suggests an intense river flow on that side, while the other side contains silty tufa. **4) Another phase of coarse-grained tufas** : increase of the river flow. **5) Tufa grain size of the dome becomes progressively thinner and ends in silty tufa**. The **tufa is no longer active**.

Discussion and preliminary conclusion

Throughout the Middle Somme, tufas from 12 m to 18 m a.s.l. show a **higher water table** than today. **Massive tufas below dry valleys** indicate **water inflow** from these valleys. The meandering shape of the **dome tufas** suggests development in a **former Somme channel**. Both Bourdon and Tirancourt underwent a subcontinuous **peat filling from 13 200 cal BP to 4 900 cal BP**, interrupted or interbedded with fine or silty tufa, indicating a **slow hydrodynamic and low water level**. Then the peat stopped developing or have been eroded and the tufa became thicker. **Around 5 450 cal BP - 2 200 cal BP**, tufa dams and oncolithes in the channels indicate a **more intense hydrodynamic**. The sediments gradually became thinner, and the **flow lighter**. **No active tufas are recorded today**.

Main references

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