Vegetation Dynamics, Human Impact and Climate influences around Lake Sevan in Armenia during the Holocene

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Topography of Armenia with location of Vanevan peat (★ : sediment core) and modern samples (● : mosses and botanical records). The black sites (▲) are paleoecological published studies and the grey sites (△) are running studies:

a. Lake Paravani (Messager *et al.*, 2013 ; 2073 m),
b. Zarishat fen (Joannin *et al.*, 2014 ; 2116 m),
c. Shenkani Lake (Cromartie *et al.*, review. ; 2193 m),
d. Kalavan Lake (Joannin *et al.*, in prep ; 1603 m),
e. Shamb-2 (Ollivier *et al.*, 2011).

The purple sites (■) are archaeological sites:
Sotk 2 (Hovsepyan, 2013)
Lchashen (Smith, 2012)

INTRODUCTION

Armenia is located in Caucasus Mountains and currently, its vegetation is largely dominated by steppes and closely linked with human practices. Holocene vegetation records from this region are often low temporal resolution and climate reconstructions are rare. Pollen-based climate reconstruction coupled to independent climate reconstructions appear necessary to fully understand climate forcing in the region during the Holocene.

The aim of this project is to reconstruct vegetation changes, to identify human activities and to quantitatively reconstruct past climate during the Holocene in the sediment archive from Vanevan peat (South-Eastern shore of lake Sevan, in Armenia). In this study we introduce high-resolution pollen, non-pollen palynomorphs, (NPP), geochemical analyses and temperature reconstruction based on pollen and branched glycerol dialkyl glycerol tetraethers (brGDGTs).

MATERIAL & METHODS

① C[14] dating
10 core samples
+
Lithology description

② XRF analysis
High resolution 5mm

Erosion
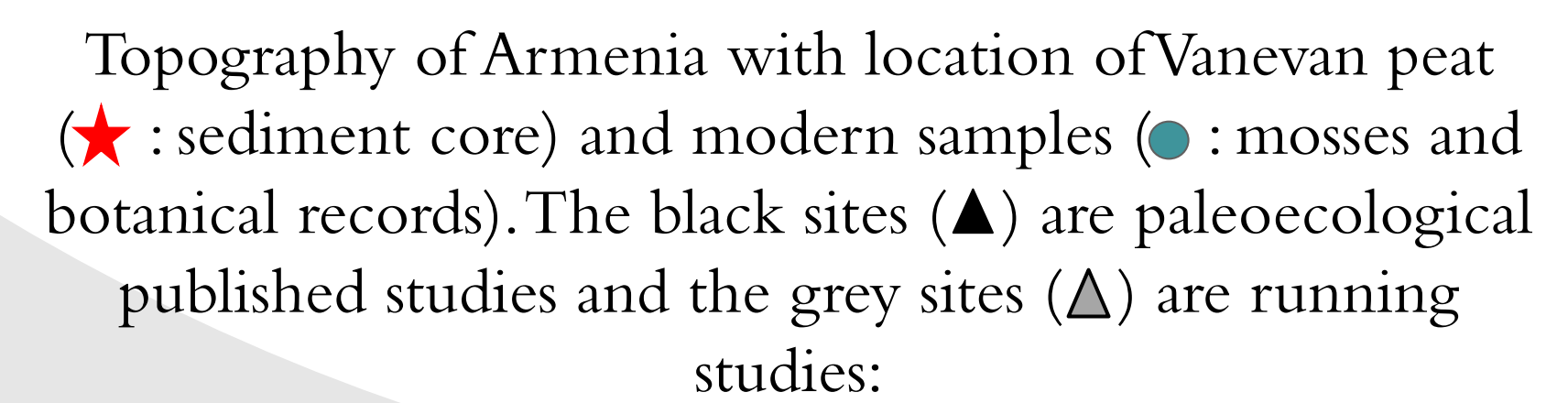Wetland dynamics

③ Pollen
28 modern samples

Modern database for climate reconstructions

93 core samples
Vegetation composition and structure
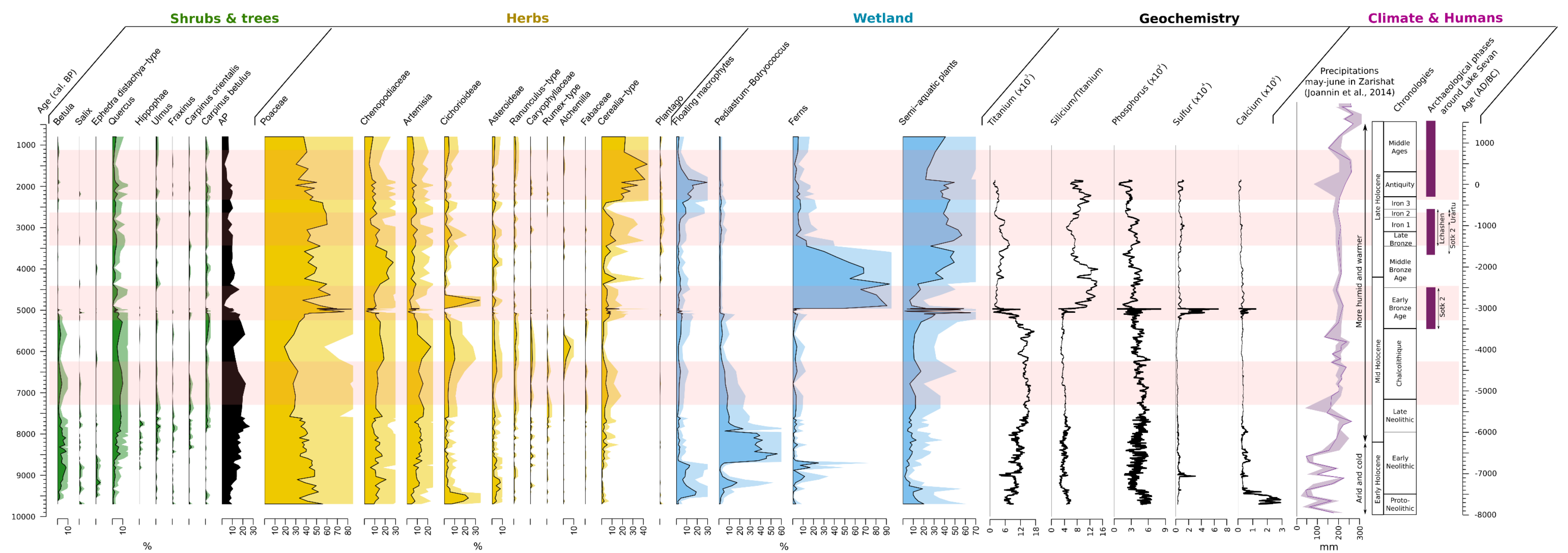Human activities
Climate parameters reconstructions

④ NPP
93 core samples

Water level

⑤ brGDGT
45 core samples

Climate parameters reconstructions

FIRST RESULTS

Select proxies against age showing percentages of main pollen taxa, algae and XRF data of Vanevan peat. Tree, shrub, and herb taxa are expressed in percentages of total terrestrial pollen. Aquatic taxa (floating macrophytes and semi-aquatic plants) are expressed in percentages of total pollen. Ferns spores and Algae *(Pediastrum-Botryococcus)* are expressed in percentages of total terrestrial pollen and NPP. AP: Arboreal Pollen. Floating macrophytes : *Myriophyllum, Potamogeton, Utricularia, Lemna, Nymphaea*. Semi-aquatic plants : Cyperaceae, *Persicaria, Sparganium, Typha*.

DISCUSSION

Wetland dynamics

The wetland studied shows major ecological changes and water-level variations :
- From 9700 to 5100 cal. BP, a lake system is recorded with a maximum water depth between 8700 and 8000 cal. BP.
- Then, over a period of 100 years, rapid water-level fluctuations emerge and finish by a drying phase at 4700 cal BP.
- Finally, a peatland with a low-level water is gradually formed and will be maintained until today.

Relationship between vegetation, human and climate

- Along the Vanevan sequence, the vegetation is characterized by steppes dominated by Poaceae, *Artemisia* and Chenopodiaceae. A maximum of arboreal taxa, representing mainly distant vegetation, is observed between 8600 and 5000 cal. BP.
- Early and Mid-Holocene climate trends impact distant vegetation dynamics and water-level variations until 5500 cal. BP.
- From 5500 cal. BP, the proportion of Cereals at Vanevan peat increases and corresponds to the installation of first farmers around Lake Sevan. Four phases with high cereal values correlate with occupation periods reported in archeological studies. Local vegetation seems to be largely influenced by human practices.

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