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On the tracks of Neandertals: the first study of the footprints from the Late Pleistocene site of Rozel

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► **To cite this version:**

Jérémy Duveau, Gilles Berillon, Gilles Laisné, Norbert Mercier, Christine Verna, et al.. On the tracks of Neandertals: the first study of the footprints from the Late Pleistocene site of Rozel. 4th Young Natural History scientists Meeting, Feb 2017, Paris, France. <hal-03000267>

HAL Id: hal-03000267

<https://hal.science/hal-03000267v1>

Submitted on 11 Nov 2020

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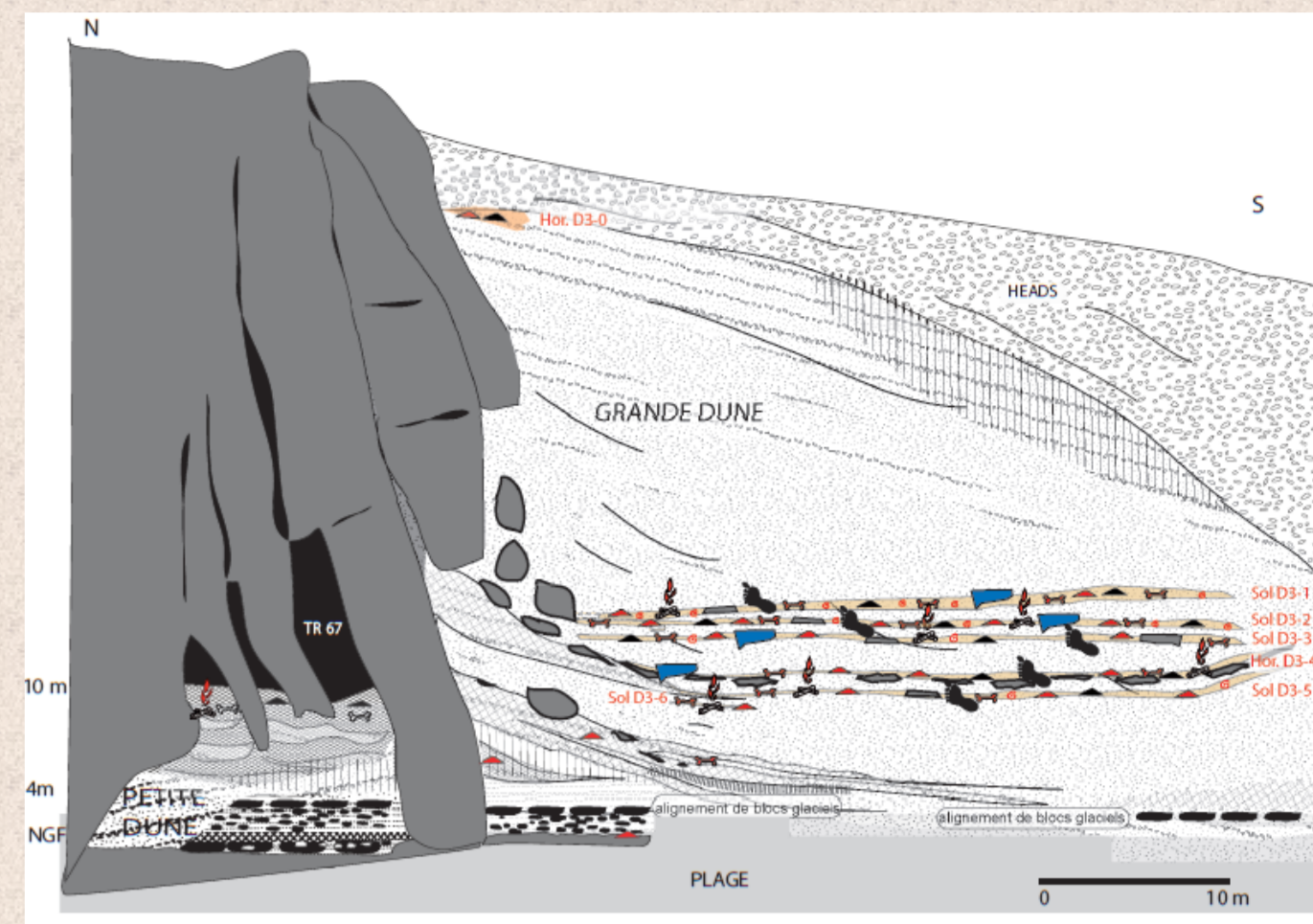


The site of Rozel

Introduction

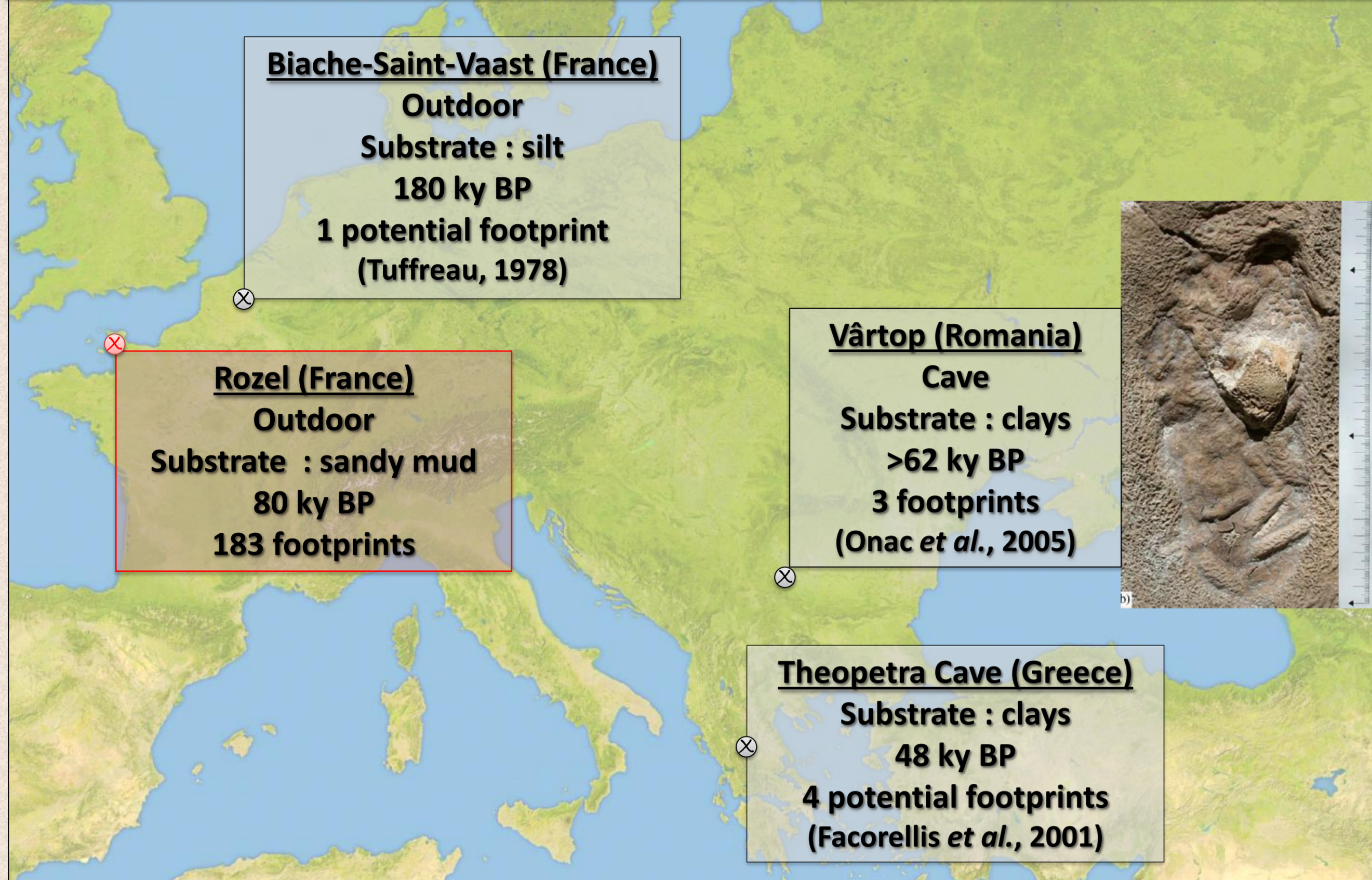
Hominin footprints, and in particular those associated with Neandertals, are **very scarce** in the fossil record. They represent the only evidences of life moments of past humans. Their study, which is complementary to the ones on osteological remains, can provide original information about the **composition of groups** and **biological characteristics** of the individuals who compose it.

The numerous human footprints discovered in Rozel since 2012 could then provide new information to our knowledge of Neandertals.



Synthetic cross section of the site of Rozel (modified from Van Vliet-Lanoë *et al.*, 2006)

Geographical distribution of the footprints associated with Neandertals



The Late Pleistocene site of Rozel

- 6 occupation layers
- Dating : 80 ky BP (OSL method)
- No human osteological remain
- Lithic assemblages attributed to the Middle Paleolithic associated with a temperate climate fauna



Levallois flakes and lower jaw of a deer discovered in Rozel (photos : D. Cliquet)

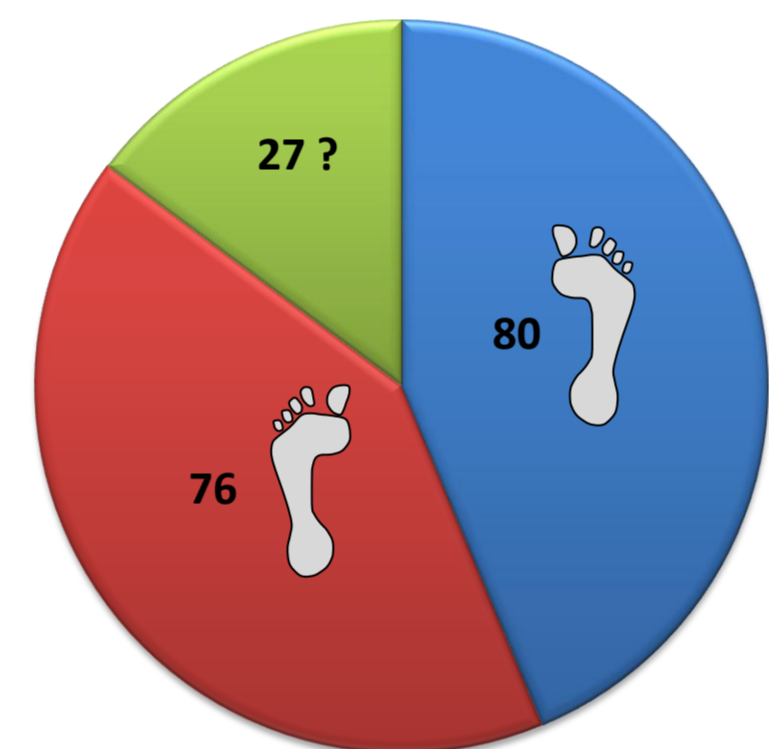
Aim & issue

- To inventory the footprints discovered since 2012
- To analyse the morphology of the most complete footprints in order to:
 1. Estimate the Minimum Number of Individuals (MNI)
 2. Estimate their stature



Material

According to criteria such as the anatomical features of the human foot, we identified **183 footprints** that belong to **5 of 6 occupations layers** identified at the site of Rozel. In order to run a morphological analysis based on **3D digitalization** data, we **selected 21 footprints**, the most complete, from one single occupation layer. Then, we compared these footprints with footprints of anatomically modern humans (experimental and archaeological samples).



Rozel footprints laterality



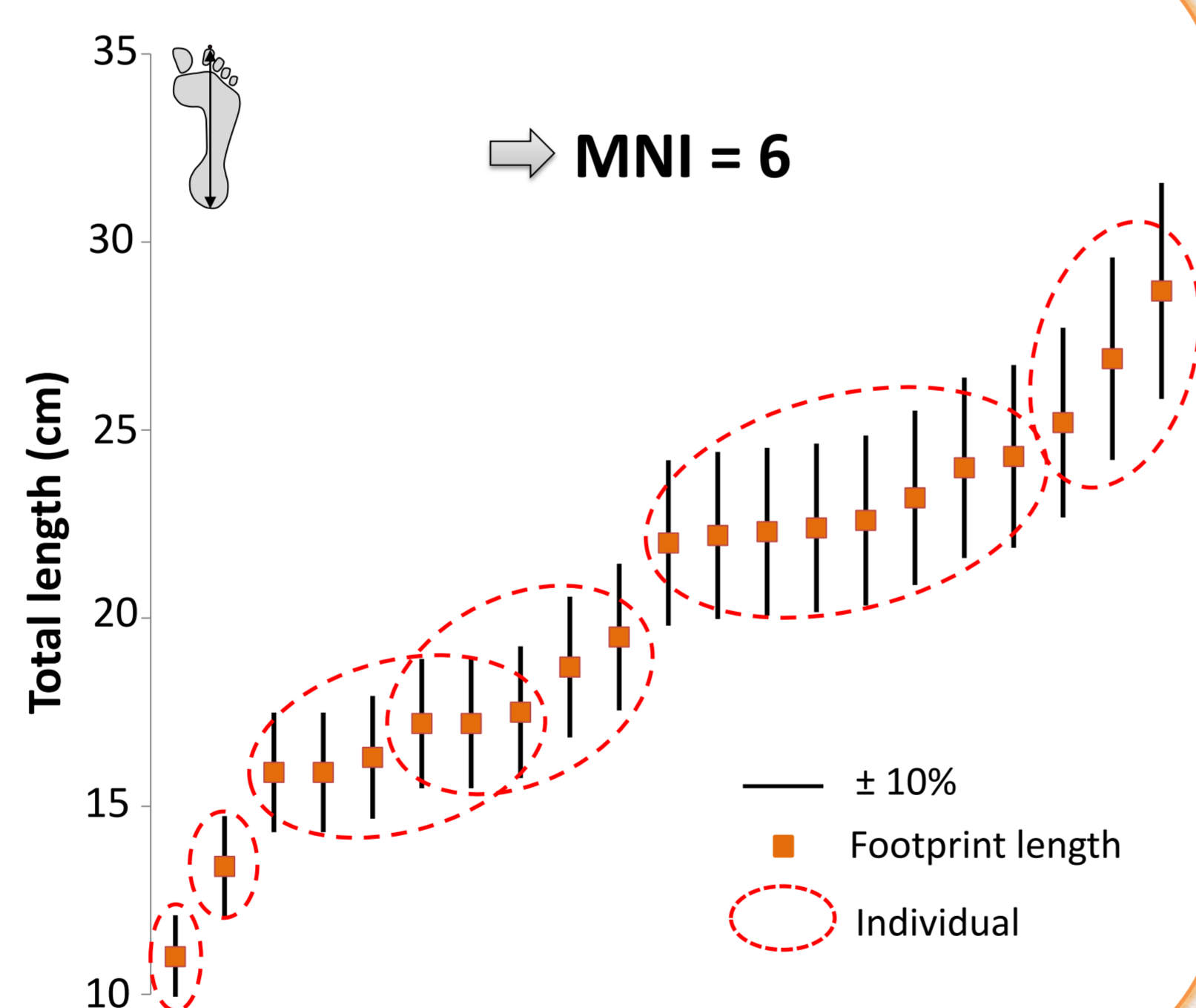
Five footprints of Rozel (photos : D. Cliquet)

From the footprints to the composition of a group

Methods: To estimate a Minimum Number of Individuals, we used the study of Dingwall and colleagues (2013) on experimental footprints.

➔ If the footprint length falls within $\pm 10\%$ of each other : same individual

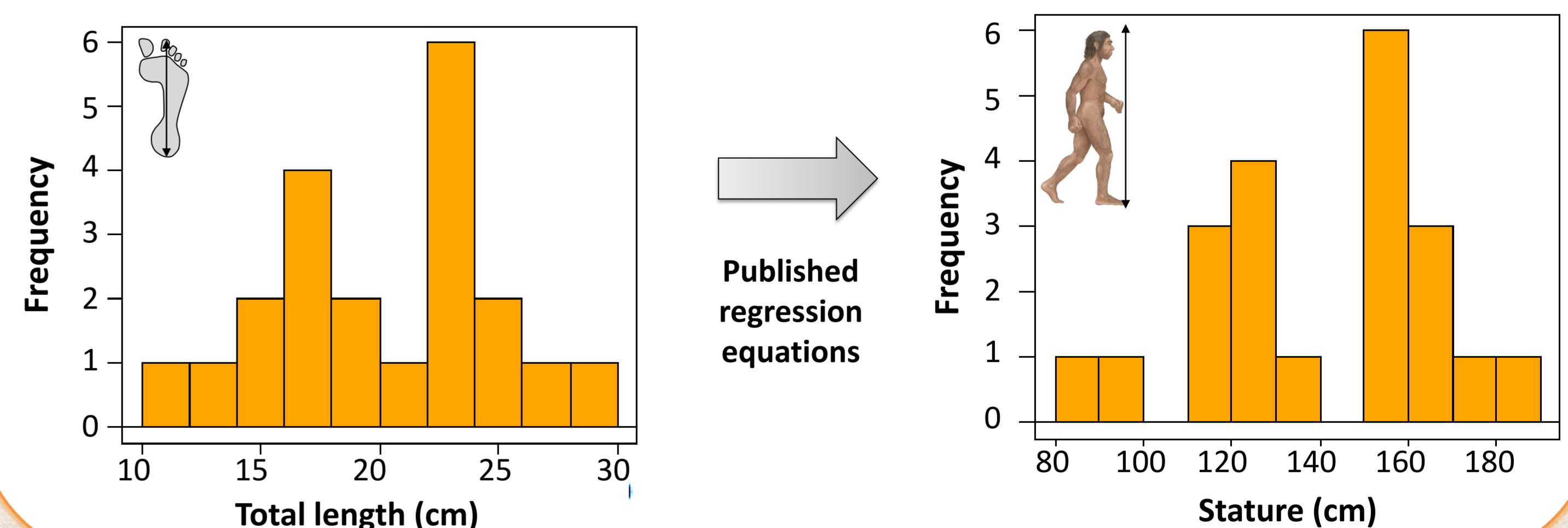
Results : We found a minimum number of **6 individuals**. Three of them are associated to footprints of small lengths (<20 cms) and would be very young (1-8 years old) according to the relation between the foot length and the age for modern humans.



From the footprints to the stature

Methods : To determine the stature from the footprints lengths, we used 4 published regression equations established from experimental human footprints. (Bennett *et al.*, 2009; Reel *et al.*, 2012; Dingwall *et al.*, 2013; Bennett *et al.*, 2014)

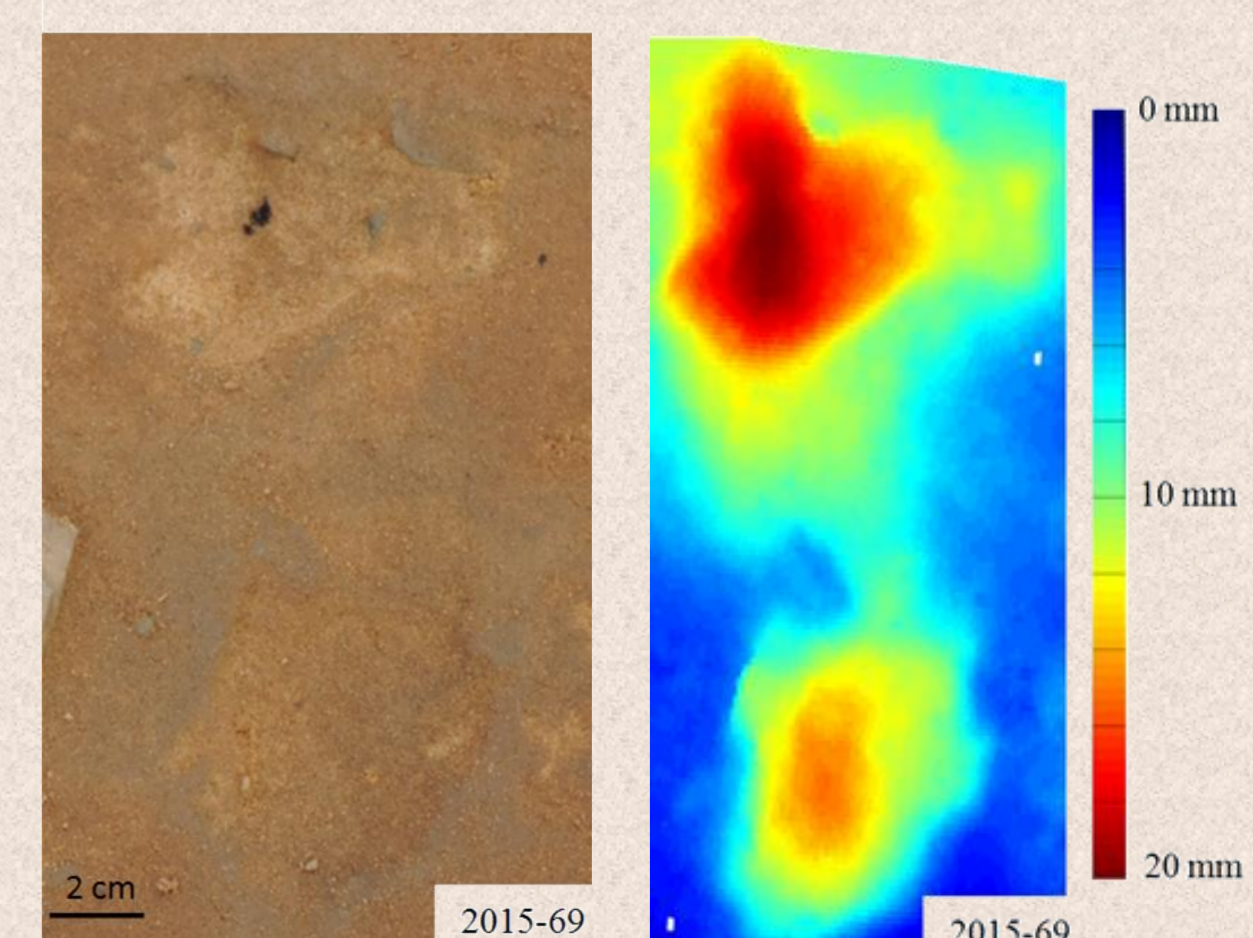
Results : The estimated statures range from 80 to more than 180 cms.



Conclusion : from the footprints to the gait

The footprints from Rozel represent the largest ichnological corpus associated with Neandertals, providing now more than **95% of the footprints attributed to this taxon**. The morphological analysis that we ran revealed the presence of **several individuals of different heights and ages**.

The results obtained here now allow us to carry on functional analyses on the most complete footprints. Our goal is to make **biomechanical studies** (study of plantar pressures, stride length...) to model the Neandertal walking and to contribute to the knowledge of their mobility thanks to an anatomico-functional approach.



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