1- Hello everyone, my presentation is called “Contribution of ecometric methods to describe local environments: the case of the Middle Pleistocene site of Lunel-Viel (Hérault, France)”. It is extracted from my PhD work called “Large herbivores from the end of Middle Pleistocene to the Upper Pleistocene in the South of France. Anthropological implications for Neanderthal lineage.”

2- Among the sites I studied for my PhD, the site of Lunel-Viel raises an interesting question. This accumulation is dated from the isotopic stage 7 and is mainly due to carnivores. Indeed, a lot of evidence shows a huge impact on the bones from the hyenids. Nonetheless, Human activities have also been observed with the presence of lithic artefacts and some marks on the bones. The sequence yields a vast amount of different species. Here, there is the list of the herbivorous and carnivorous taxa which occurred in the sequence exclusive of the birds, reptils and microfauna one. The composition of the faunal assemblage (macro and micro fauna) suggests a temperate Mediterranean climate.

3- It is very important to notice the geographical position of the site: in the Southeast of France, just near the Rhone river delta. Nowadays, this region is a famous wetland known as the Camargue region. The site of Lunel-Viel is located very close to this peculiar biotope. As you can see on these pictures, the Camargue is a vast wetland salty and humid. Horses and cattle are being bred in this region, often in semi-feral conditions.

4- In nineteen eighty (1980) occurred the first publication about Lunel-Viel horses by Marie-Françoise Bonifay. She notices the great robustness of this horse longbones. Here, you can see an example with the slenderness index of the metacarpal. The slenderness index compare the length of the metacarpal to it middle shaft transversal diameter. In this graph, the index of Lunel-Viel horses, in red, is compared to several other populations from France and Germany and from the Middle and the Upper Pleistocene. You can see it is really distinct from the others. The robustness of the horses’ longbones is often correlated with the humidity of a biotope. Marie-Françoise Bonifay suggested that the environment around the site of Lunel-Viel may have been a swamp just alike nowadays Camargue according to these observations. Furthermore, she described a new subspecies from Lunel-Viel horse remains and called it *Equus mosbachensis palustris* in accordance with the hypothetic biotope it may have been lived in.

5- In order to verify the hypothesis of Marie-Françoise Bonifay, I compare the diet of horses and cattle from the present-day Camargue to the one from Lunel-Viel using meso- and micro-wear analysis. They separate the ungulates in 4 diet categories: grazers, browsers, mixed-feeder and furgivores. Dental meso-wear analysis is a macroscopic study of the shape of teeth cuspids. The degree of wear of the cuspid is directly linked with the ungulate diet and it is maintained for quite a long time. Thus mesowear analysis inform about the ungulate diet of the last months of it life. Dental micro-wear analysis is a microscopic study of the micro-traces yield on the tooth occlusal enamel. It indicates the diet of the last days of an ungulate. These two scale methods combined bring very valuable information about the ungulate diet and its variations during the year.

6- I collected data from the teeth of the *Bos* and the *Equus* from Lunel-Viel and from extant cattle and horses from Camargue. The teeth were collected in the Tour-du-Valat which is a research centre located inside the wetland. The animals live there in semi-feral conditions and are never artificially feed. Information about the time of death were available for bovids but not for equids.

7- The Camargue and the Tour-du-Valat in particular, is a very divers region with various landscapes and vegetal biotopes. Several species of monocotyledon and dicotyledon plants are presents and are coexisting in different proportions in the eight different landscapes defined for the Camargue region.

8- Ecologists published several studies about the horses and cattle diet habits in Camargue. They observed that during autumn and winter, bovids fed in coarse grasslands with shrubs and old-field grasslands which are very mixt habitats with both monocotyledon and dicotyledon plants. Horses fed in old-field and shallow marshes in which monocotyledon plants are predominant with the presence of salt marsh plants. In spring, both bovids and equids largely feed on monocotyledon and salt marsh plants. In summer, the two species target especially monocotyledon plants. Thus, in Camargue, the principal difference between cattle and horse is that the first eat more dicotyledon plants than the second across the year.

9- This graph represents the mesowear score for each *Bos* and *Equus* population with on the left, the diet ranges from extant species. We can already spot many differences. First, it seems that the mean diet for the last months of life of cattle and horses from the Tour-du-Valat is almost identical matching the mixed-feeder category. At Lunel-Viel the diet of bovids and equids are very different during their last months. Indeed, *Equus* is grazer whereas *Bos* is more browsers. Thus, the feeding behaviour of *Bos* and *Equus* at Lunel-Viel does not fit the one at the Tour-du-Valat. *Bos* and *Equus* don’t share the same resources and are more selective. At Lunel-Viel, horses will consume more monocotyledon plant and bovids more dicotyledon compare to the Tour-du-Valat herbivores.

10- On this graph, the number of pits and scratches for each *Equus* and *Bos* population are display. They correspond to the last day of life of each specimen. We can already see that the different population are well separated on the graph

11- First, the equids and bovids populations from Lunel-Viel are different on the two axes. There is a higher number of scratches on *Equus* teeth and a higher number of pits on *Bos* teeth. Therefore, at the Tour-du-Valat, both *Bos* and *Equus* are characterized by an important number of pits compare to Lunel-Viel.

12- I conducted a Kruskal-Wallis test to compare statistically the data between the Tour-du-Valat and Lunel-Viel. It shows that there is no difference between the diet of cattle and horses at the Tour-du-Valat. At Lunel-Viel, the number of scratches on horse teeth is not statistically different to those observed on cattle and horses Tour-du-Valat teeth. Nonetheless, the number of pit is always different. The Lunel-Viel bovid diet is always different to any other populations.

13- The percentage of low scratches range, meaning between 0 and 17, allow a separation between three categories of the herbivorous diet on the microwear analysis scale. As it was observed by the ecologists, the diet of *Equus* from the Tour-du-Valat is grazer and the cattle habits are more mixed-feeder, in particular in autumn and winter. At Lunel-Viel, horses are grazers to mixed-feeder according to the layer whereas the *Bos* is always browser. This means that both on meso and microweat analysis scale, the environment around Lunel-Viel allow a full diet segregation between bovids and equids and this is not the case in extant Camargue.

14- Another difference between Tour-du-Valat and Lunel-Viel teeth may be taphonomical. Indeed, during the analysis, 50% of the teeth from the Tour-du-Valat were excluded because of major surface alterations just like the one pictured here. On another hand, the teeth from Lunel-Viel were quite well preserved with only 20% of them to degrade to be studied. It is necessary to go through further study to find the cause of the alteration but it may be due to the high quantity of salt cattle and horses eat in Camargue and not, perhaps at Lunel-Viel.

15- To summarise, important differences in the diet of bovids and equids from Lunel-Viel and the Tour-du-Valat were spotted on the two analysed scales. During their last months, *Equus* and *Bos* from the Tour-du-Valat eat both monocotyledon and dicotyledon plants whereas at Lunel-Viel, *Equus* were more specialized in monocotyledon plants and *Bos* in dicotyledon ones. For their last meals, bovids and equids teeth from the Tour-du-Valat show an important number of pits which is not the case at Lunel-Viel. Furthermore, the animals cohabited in very similar vegetal biotopes since *Equus* is grazer and *Bos* mixed-feeder to grazer. At Lunel-Viel, *Equus* and *Bos* occupied more distinct niche since the *Equus* are grazers and the *Bos* browsers. Both meso- and microwear analysis show an important segregation in *Bos* and *Equus* feeding habits which is not the case at the Tour-du-Valat. Finally, the teeth at the Tour-du-Valat show important micro-taphonomic alterations which were not observed at Lunel-Viel. All these observations suggest that the *Bos* and *Equus* diet from the two locations were different. It is very unlikely that Lunel-Viel bovids and equids fed in a swamp suggesting that the local environment around the site was not similar to the actual Camargue.

Thus, meso- and microwear analysis prove themselves again to be a very valuable tool to discuss local environment and allow a response to a very legitimate hypothesis suggested forty years ago.