# EXAMINING PREY MOBILITY IN THE MIDDLE PLEISTOCENE USING STABLE ISOTOPE ANALYSIS.


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# *Predation behaviour in the Middle Pleistocene*

- Hunting as a major part of social behaviour
- Became a debate between hunting V scavenging
- What can animal mobility tell us?
- How they respond to climate or potential hominin intervention might give us complimentary information about hunting behaviours

# *Conventional methods*

- Zooarchaeological analysis
- Lithic analysis
- Rockshelter Stratigraphy and Physiography



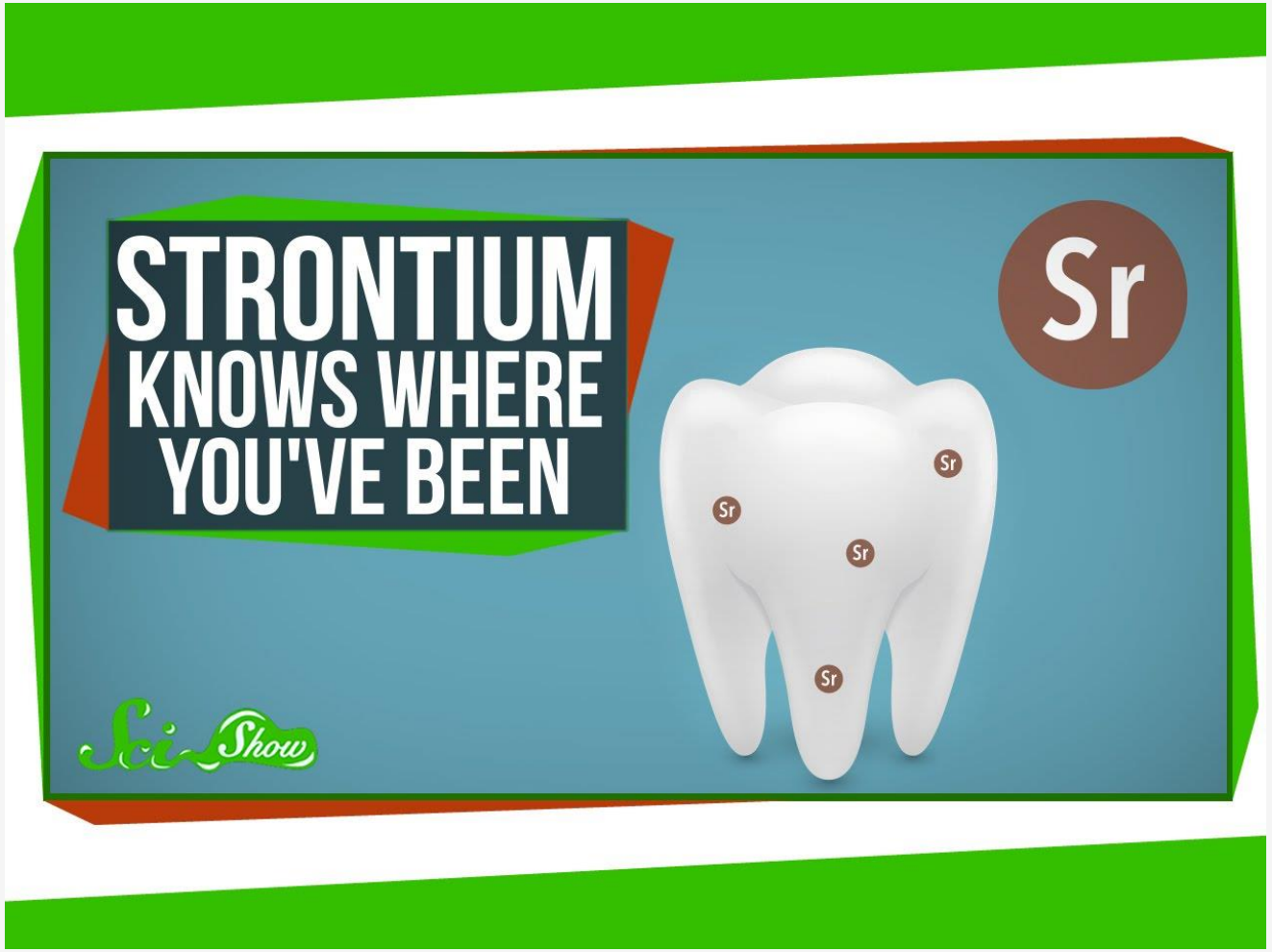
# *AN ADDITIONAL, COMPLEMENTARY APPROACH*

# *Why LA-MC-ICPMS*

- Very little sample preparation
- Non destructive
- Can identify incremental change
- Seasonal mobility of bovids between geological units
- Intra-sample heterogeneity
- Already have strontium maps of Israel and France from Moffat 2013

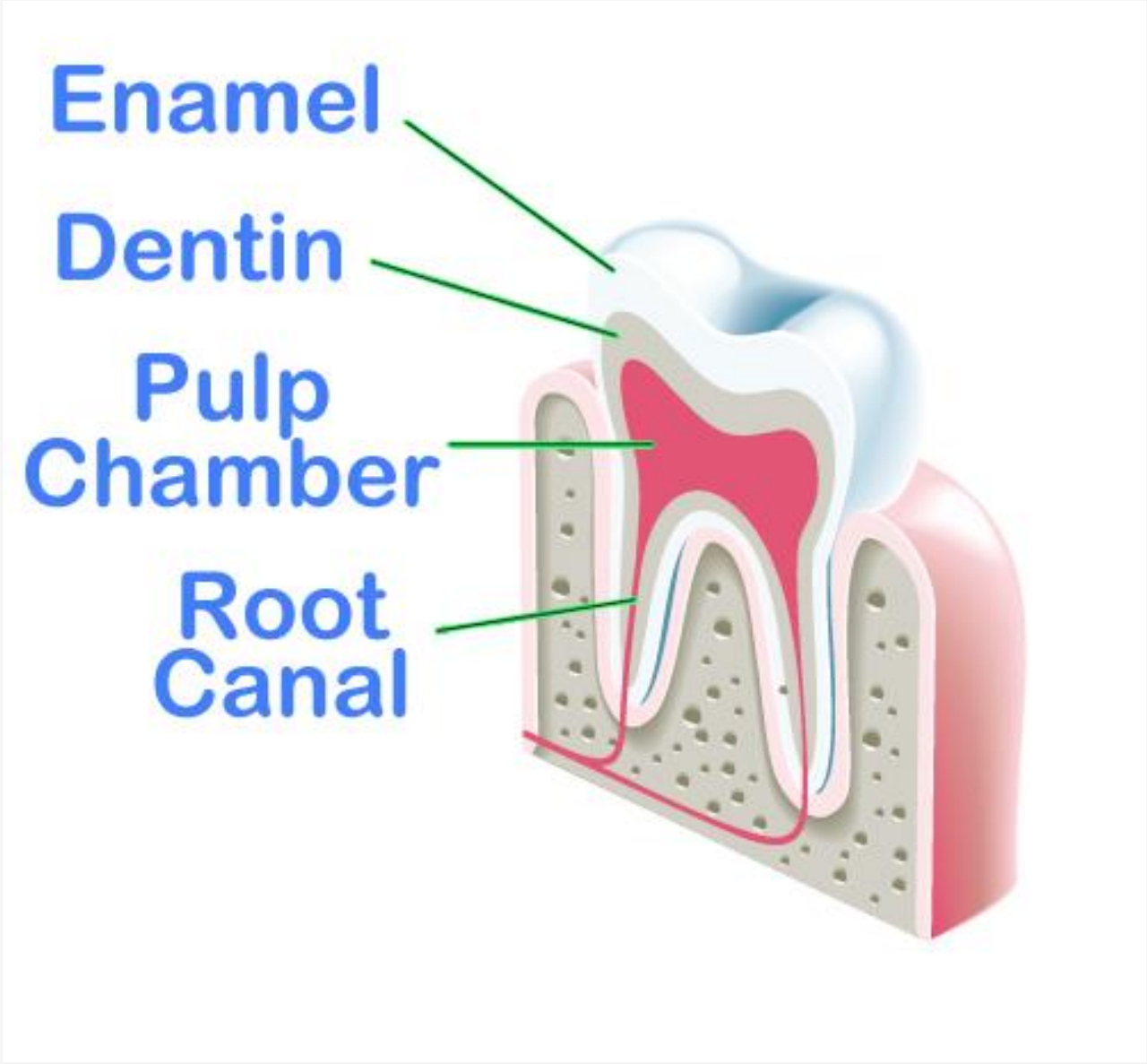
# *Why strontium?*

- Strontium values change very little as they pass from weathered rock, to soil, and into the food chain
- "You are what you eat"
- Indicates dietary change over time and can therefore show change in residence



# *Why do we use dental material?*

- Strontium substitutes for calcium in the foodweb and is deposited in the enamel and bone
- Enamel forms during childhood, and reflects the childhood diet, and childhood locale
- Enamel is very resistant to post-burial diagenesis
- Dentine is easily overprinted during post-burial diagenesis and so may provide a indication of the "local" value for comparison to enamel.



# *What might it mean?*

**If the enamel $^{87}Sr/^{86}Sr$ has the same value as dentine $^{87}Sr/^{86}Sr$ it can mean:**

- The individual was born and lived locally during entire lifetime.
- The individual moved from one locale to another with identical $^{87}Sr$

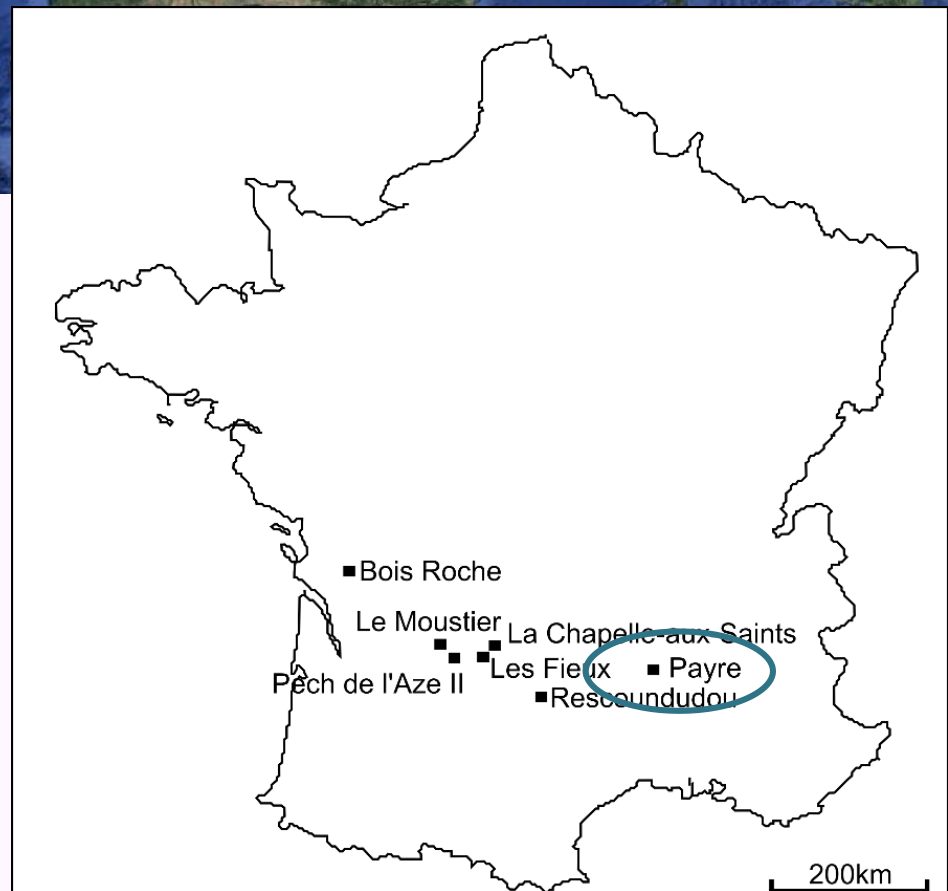
**If enamel $^{87}Sr/^{86}Sr$ is different to the dentine $^{87}Sr/^{86}Sr$ it is likely:**

- The individual spent juvenile years in one locale and adulthood in another

Adapted from Slovak and Payton 2011: 744

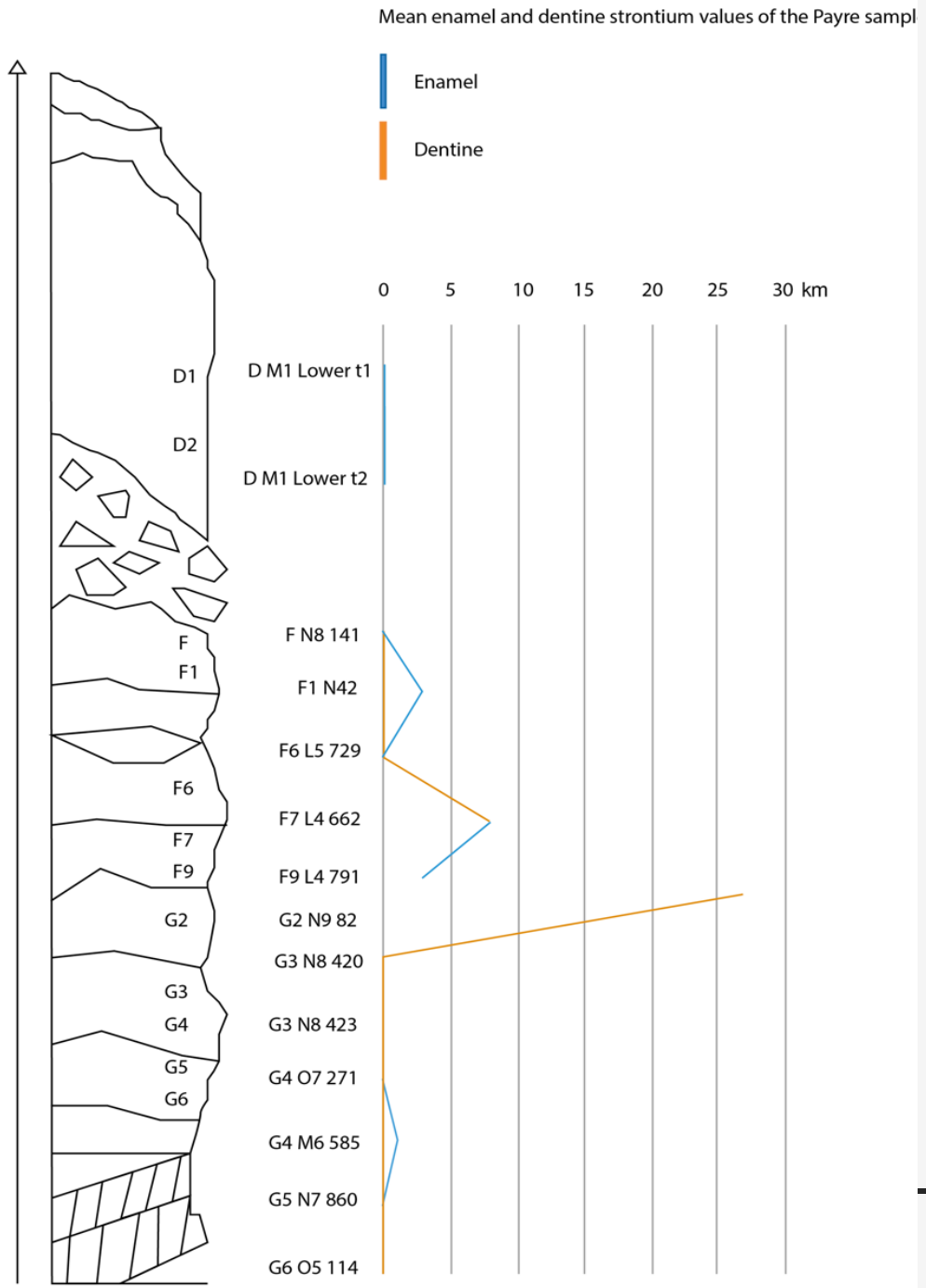
# *Payre*

- Located in the Ardeche region
- Massif Central
- Rhone Valley
- Middle Palaeolithic site located in the Rhône Valley in southwest France.
- Regular excavations have taken place since 1990 (Moncel, 2003).
- 14 *Bos primigenius* teeth were discovered in various archaeological levels, from layers D, F and G.

# *PAYRE RESULTS*

- Overall $^{87}Sr/^{86}Sr$ range of 0.706246 to 0.715921
- Analysed from a total of 1,160 spots



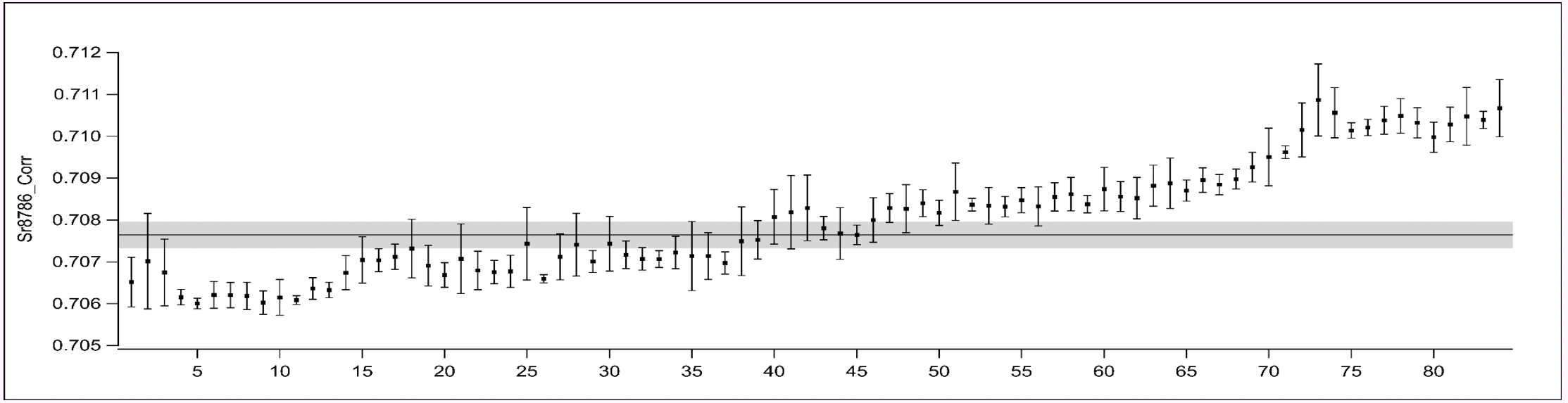

# *MEAN MOBILITY DISTANCE OF PAYRE SAMPLES*

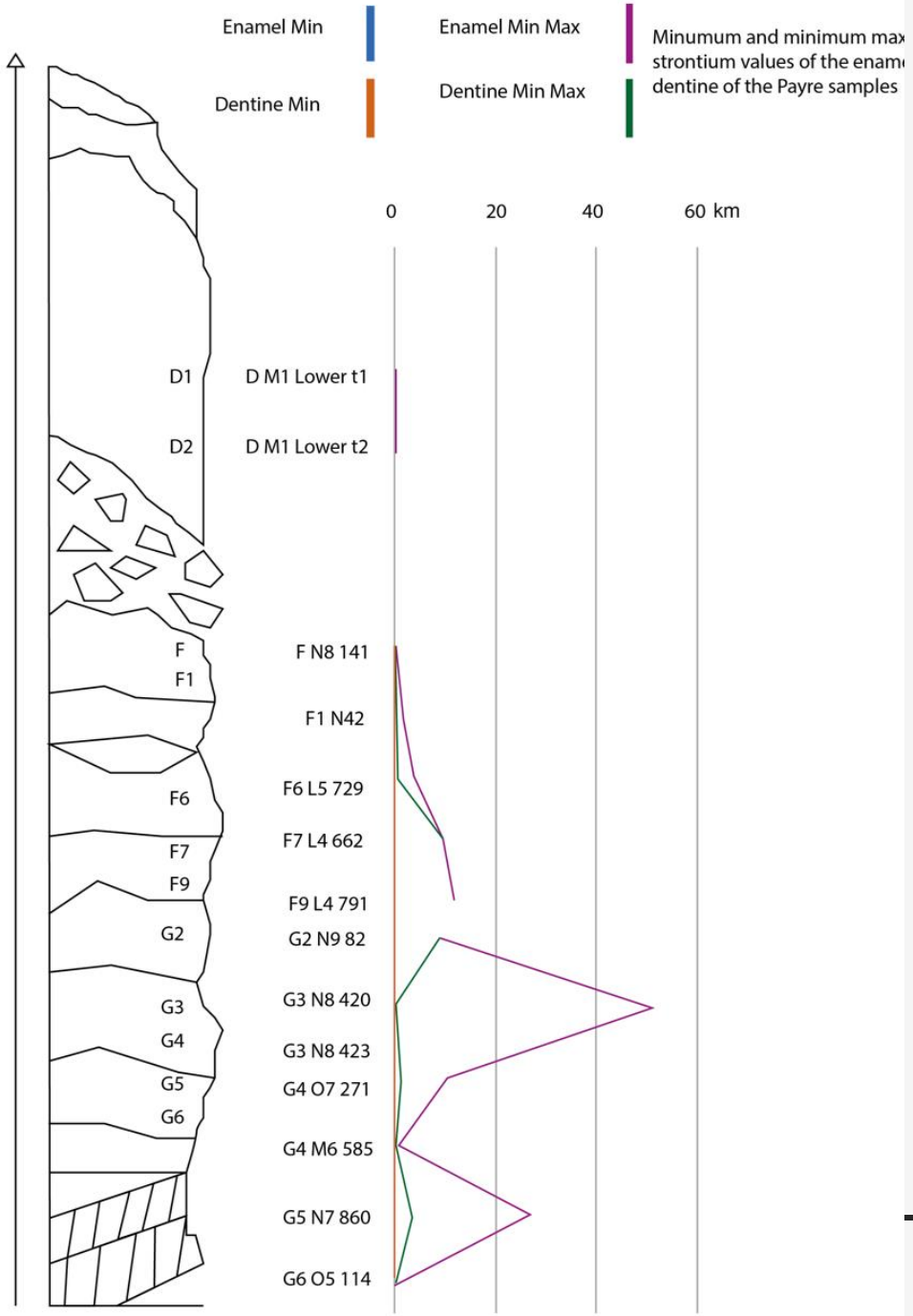
- The three main occupation levels (G, F, and D) fall within MIS 8-7 and MIS 5d/5e or end of MIS 6.
- The environment across the study period broadly would have included temperate forested areas as well as open spaces (Laville et al. 1980).
- MIS 7e was primarily deciduous forest, 7d was steppe with some shrub, 7c was Montane/*Pinus* forest, 7b was steppe, 7a was open mixed oak forest, 6 was steppe, 5e was dense woodland and 5d was steppe.
- There was dense human occupation in these layers (G, F and D) as well as an abundance of herbivores, including deer (*Cervus elaphus*), horses (*Equus* sp.) and bovids (*Bos primegenius*)

# *Benefits of incremental sampling*

- Using incremental sampling means we reduce the chance that the mean values are not truly representative of the individuals life.
- It gives a better idea of where they were moving in the landscape.

G5 N7 860 Enamel - *Bos Primigenius*






# *How far were the prey moving?*

- Using the data from incremental sampling we have a better idea of the distances moved by the animals across the landscape.

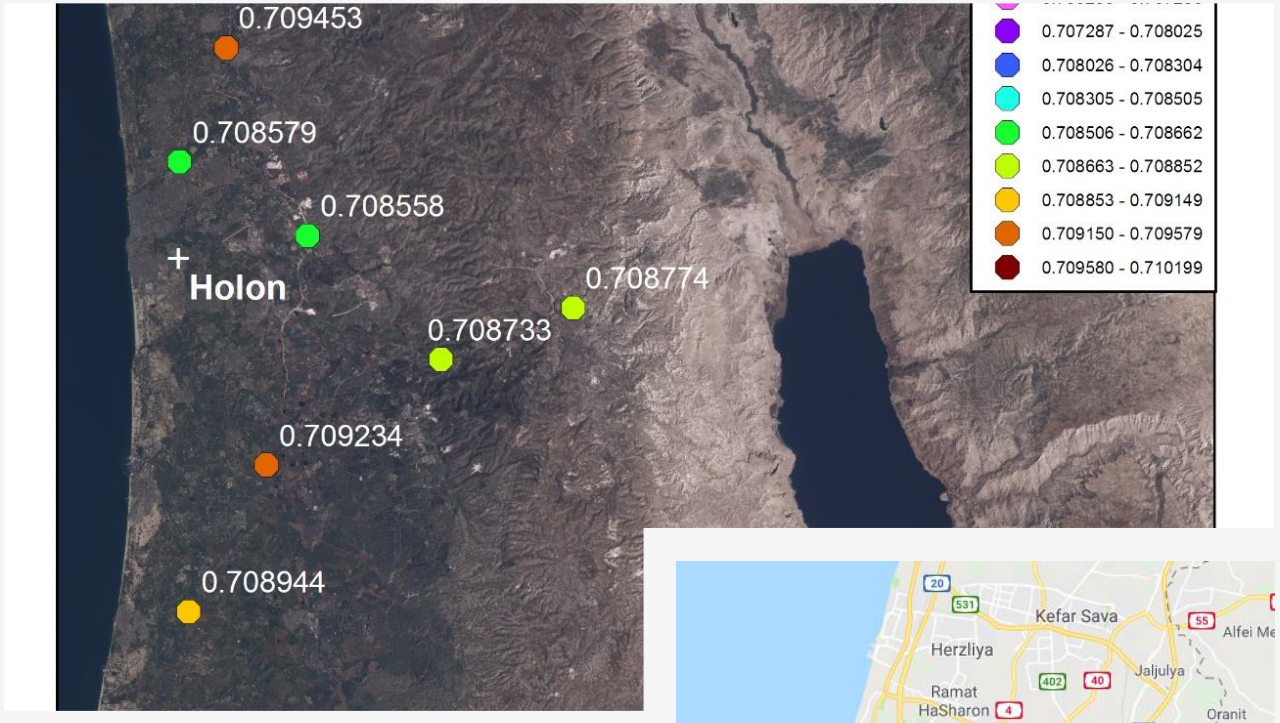
# *What can strontium isotopes tell us about prey mobility at Payre?*

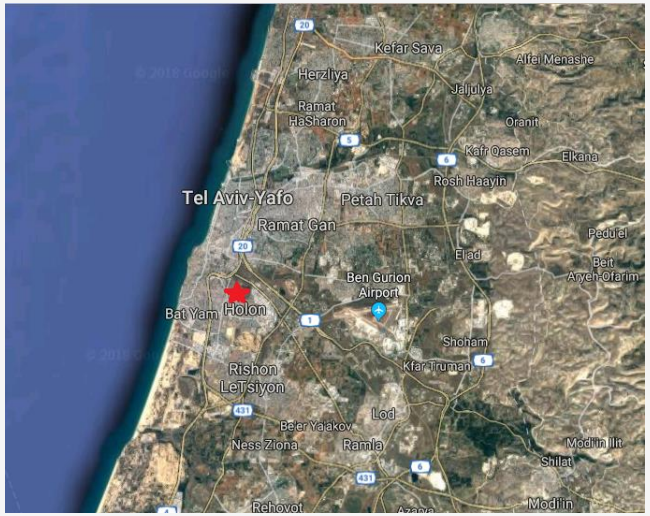
- High level of mobility between samples
- Clear indication of reaction to climatic changes
- Level D has a humid, temperate environment. The lack of mobility in level D suggests there was little need to migrate far for food sources. Particularly when compared to levels F and especially G. The environment here was still temperate however would have been cooler than the later period of level D.
- We see a dramatic decrease in mobility through time, with *Bos* in the earlier levels F and G showing greater mobility. The range of mobility in level G reached up to 51km from the site, far greater even than the maximum distance reached of 8km in layer F.
- Intra-sample mobility
- Overall it suggests that Neanderthal prey were quite mobile

# *Holon*

- Located on the coastal plain of Israel
- Open-air late lower Palaeolithic site
- Excavations between 1963 to 1970
- Yielded ages of 204 ± 16 ka and optically stimulated luminescence (OSL) dates of approximately 200 ka (Porat et al. 1999)

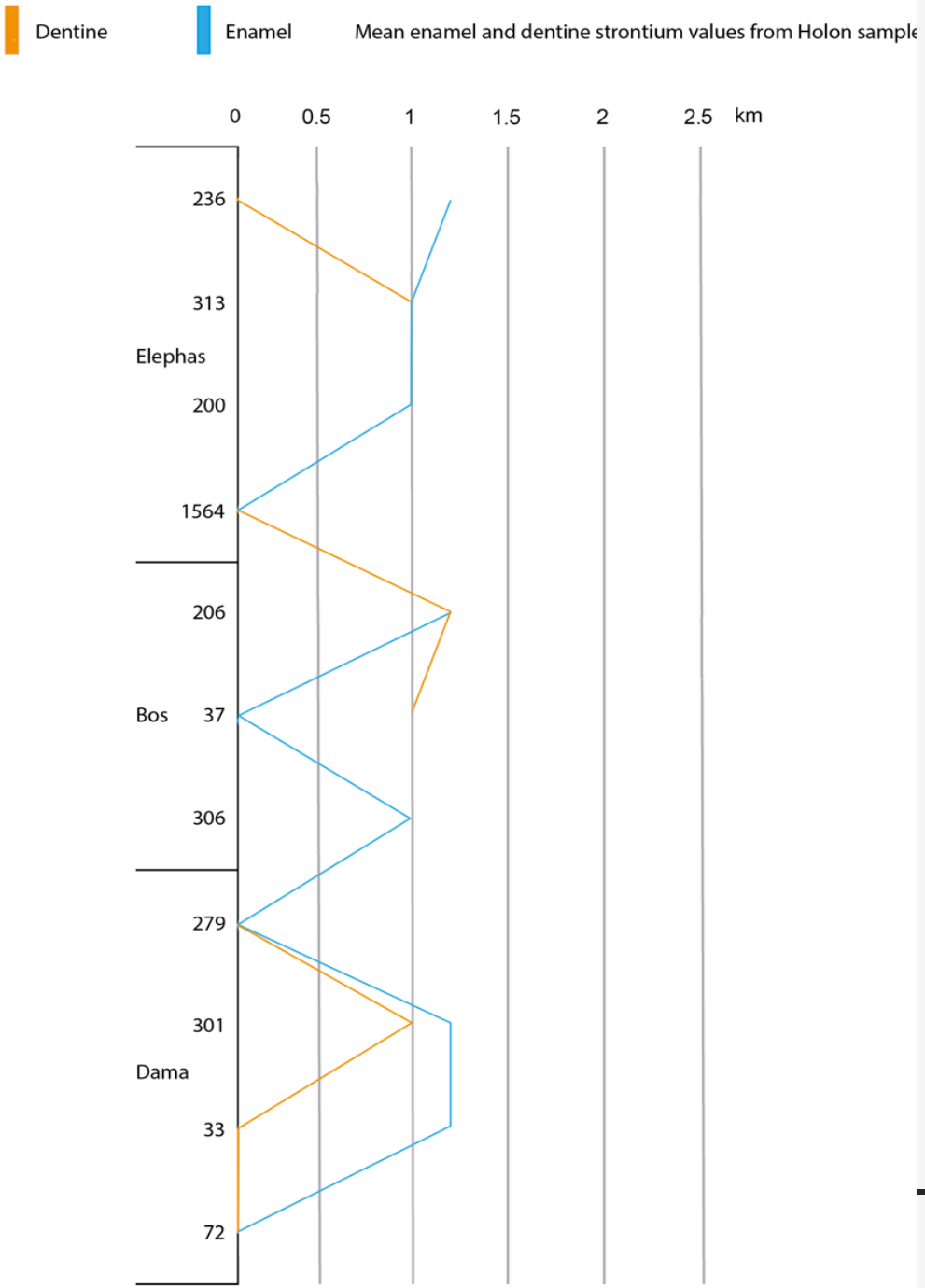
- 11 faunal teeth (*Bos primigenius x3, Dama* dama cf. *mesopotamica x4* and *Palaeoloxodon antiquus x4*) from the artefact bearing unit
- Dates are contested , however the site can fall no earlier than MIS 7 and no later than MIS 8 ed on geology and location.



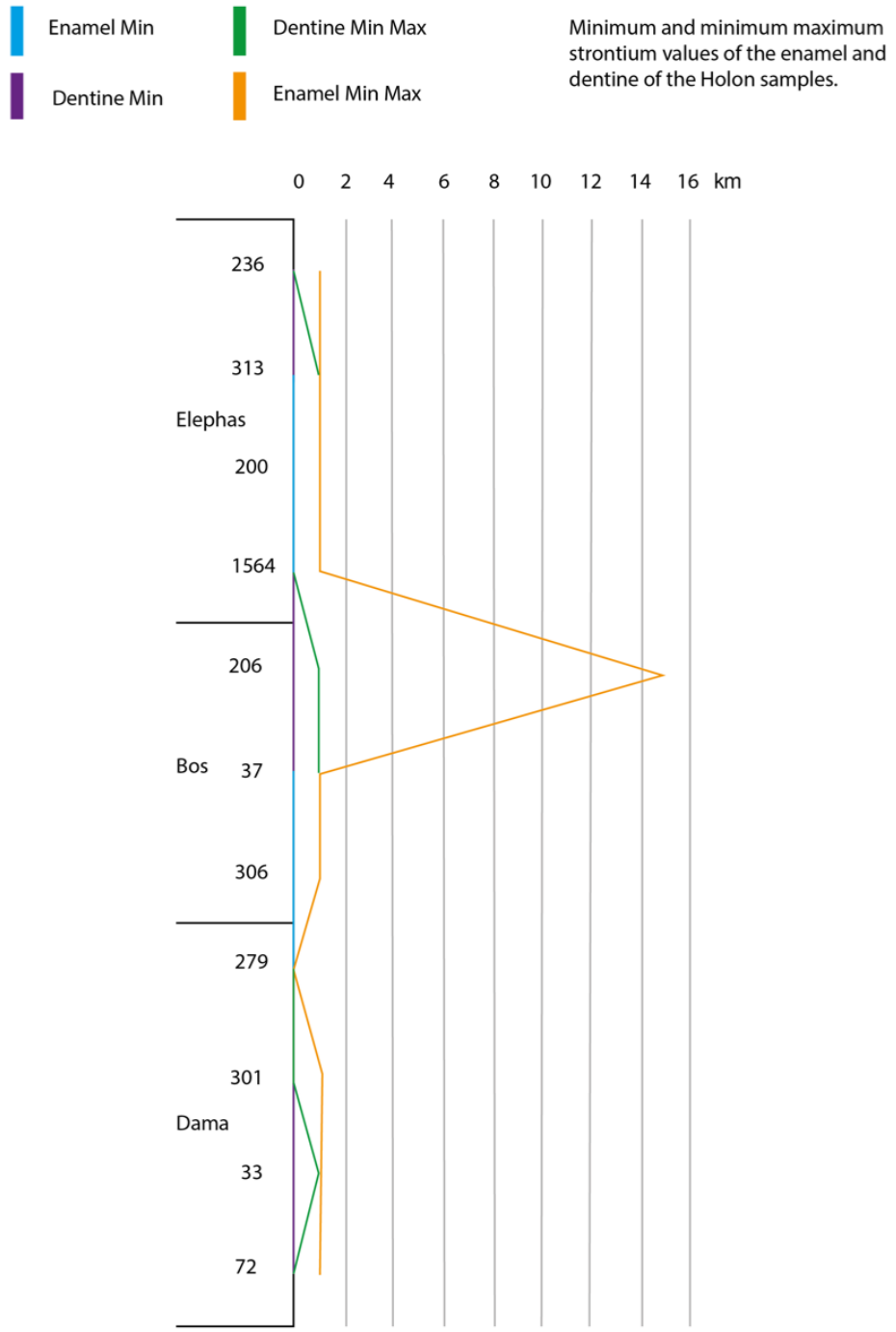




# *HOLON RESULTS*

- $^{87}Sr/^{86}Sr$ range 0.707794 to 0.709378
- Analysed from a total of 821 spots




# *Mean mobility distance of Holon samples plotted by species*




# *How were the prey moving?*

# *What do strontium isotopes tell us about mobility at Holon?*

- Less mobile than the Payre samples, however the geology of Israel is less amenable to high resolution mobility mapping
- Prey at Holon during MIS7 are considerably less mobile then at Payre during the same period-is that a function of climate, resource availability or hominin species?
- Many of the Holon samples were not mobile when they were juveniles, but began migrations during adulthood
- Holon is located in an attractive area for fauna with a fluctuating fresh water marsh
- Overall they were likely closer to the Holon site, suggesting that the hominins at this site would had the ability to been opportunistic in their hunting or scavenging and didn't necessarily need to go out and actively search for prey. This fits our interpretation of the site which was located next to a river – a locality where hominins (and also animals) came and so could be hunted and/or scavenged.

# *Final thoughts*

- By itself, strontium isotope analyses on animal teeth can't determine the hunting behaviours of hominins.
- What it can do is provide complimentary information – if the prey are mobile or not, local or non local: these all add to the nuanced interpretation of a site. Essentially, if the isotopic signature shows that the animals inhabited areas close to the site, then it means people hunted them close by and vice versa.
- The isotopic signature then offers a more robust data set with which to assess hominin hunting strategies and their changes over time.
- I think it shows that hominins (if they couldn't hunt) were smart enough to come to localities where they knew they would find carcasses to scavenge.
- What is urgently needed is more isotope studies of similar sites from the same period

# *Thank you to:*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