

Wet preservation in a semi-arid environment – well features from the Bronze Age Sintashta settlement Kamennyy Ambar (Russia) as multidisciplinary archives

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Water is one of the key factors for people when choosing a place to stay – this issue becomes even more important for herdsmen who are responsible to supply their stock. That is why the semi-arid Transural steppe with its gently rolling landscape intersected by perennial streams with fertile meadows was so attractive.

However, wells were constructed within building units of Kamennyy Ambar (**Fig. 1**) and other fortified settlements assigned to the archaeological Sintashta culture (2100–1950 cal. BC at the study site; KRAUSE & KORYAKOVA 2013). Especially advantageous within this rather dry environment is the subfossil preservation of organic material in the lower levels of the wells due to saturation of sediments by ground water (**Fig. 2-3**).



Fig. 1 Well features 4.1 and 6.1 during excavation.



Fig. 2 Well features 2.1 and 2.1a with preservation of wattle work.



Fig. 3 Wooden object from Well 2.9 (photo: B. Voss; drawing: G. Lanz).



Fig. 4 Open core drill at Kamennyy Ambar.

Access to stratified material is *only possible* by means of obtaining profile columns prior to excavation (**Fig. 4**).

Sediment profiles served as archives for: pollen and plant macro-remains analyses, radiocarbon dating (AMS), thin section analysis, and archaeology.

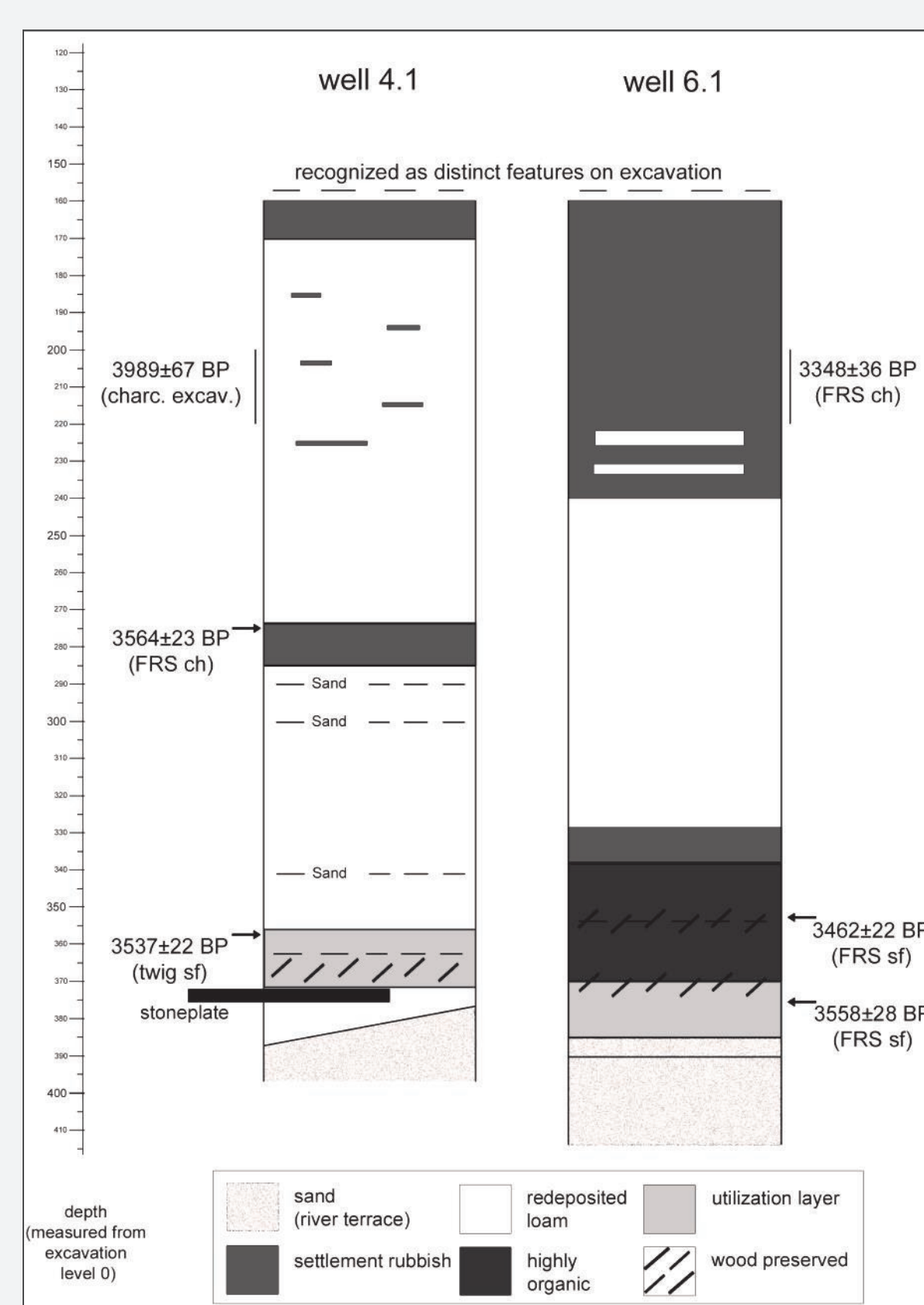


Fig. 5 Stratigraphic scheme of Wells 4.1 and 6.1.

Well stratigraphy proved to be very heterogeneous at Kamennyy Ambar. In general, organic sediments can be observed at the bottom above the terrace sand. In the upper parts redeposited loam and more organic layers with settlement rubbish alternate (**Fig. 5**). A number of features provided wooden preservation (**Fig. 3, 5**).

Wells 4.1 and 6.1 are located next to each other (**Fig. 1**) within the area of House 4 which was later occupied in part by the smaller and only temporal House 6. They both show highly organic sediments in

the lower part. Above the grey coloured utilization layer (**Fig. 5, 7**) wood, fruits/seeds, buds, vegetative plant parts as well as pollen and spores and also stem-phytolites (rondels) are preserved that cover the whole vegetation period.

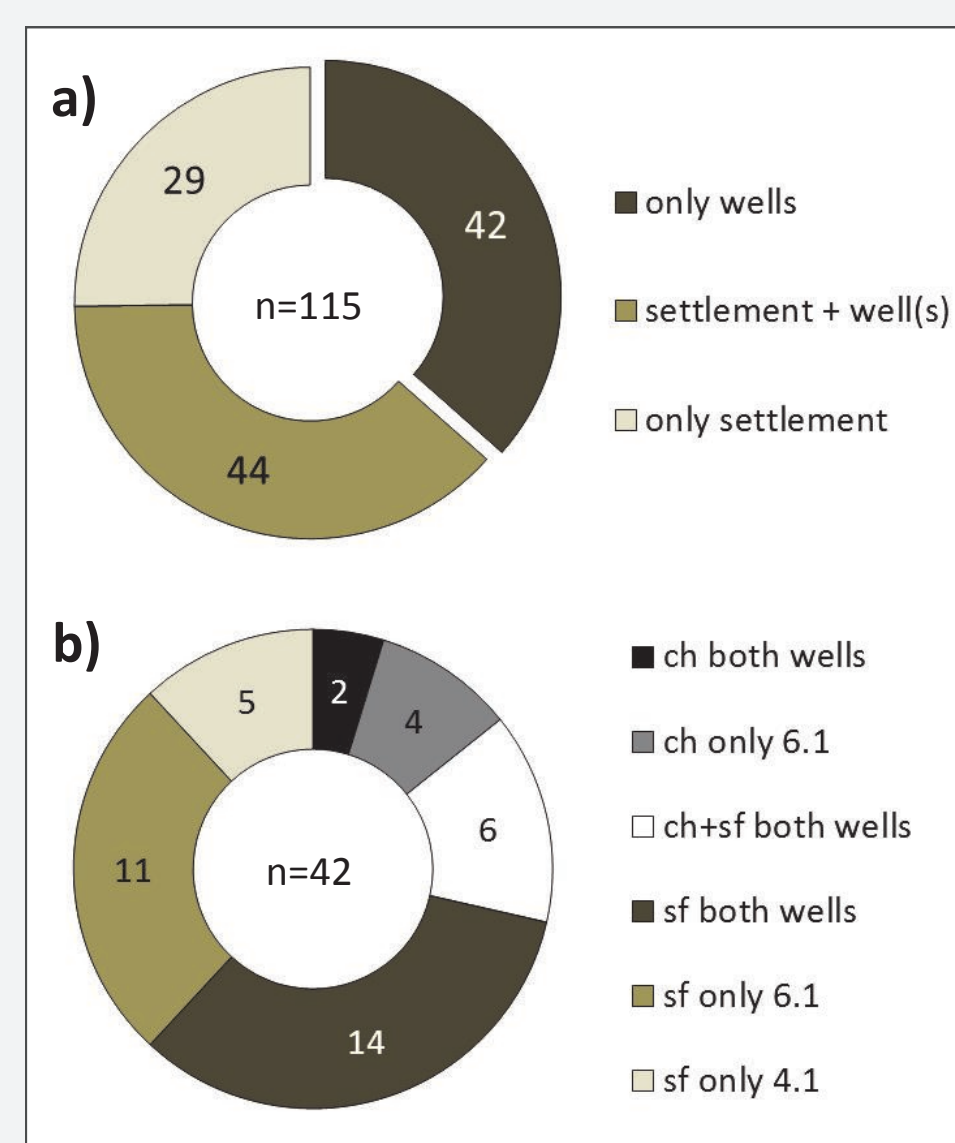


Fig. 6 Number of plant macro-remains taxa **a)** in all features in Kamennyy Ambar **b)** taxa only preserved in Wells 4.1 and 6.1 (ch charred, sf subfossil).

Many plant macro-remains are only represented in wells but not in dry soil cultural layers (**Fig. 6**). The integration of pollen and plant macro-remains analyses gives a much more detailed picture of the Bronze Age vegetation (RÜHL ET AL. 2015; STOBBE ET AL. 2016). Altogether, 115 plant taxa (pollen and macros) out of 45 plant families could be identified.

Our results highlight the value of water-logged sediments in the steppe considering the strong selection of preservation in cultural layers.

The association of Poaceae, small seeded Fabaceae as well as short plant fibres and stem fragments pointed to the presence of dung, but identification only via charred macro-remains is quite difficult.

However, the presence of spores from coprophilous fungi and sheep/goat coprolites in the thin sections of Well 6.1 (**Fig. 8b**) verified that dung formed part of the heterogeneous matrix of the rubbish layer as well as of the lower highly organic accumulation (**Fig. 7**).

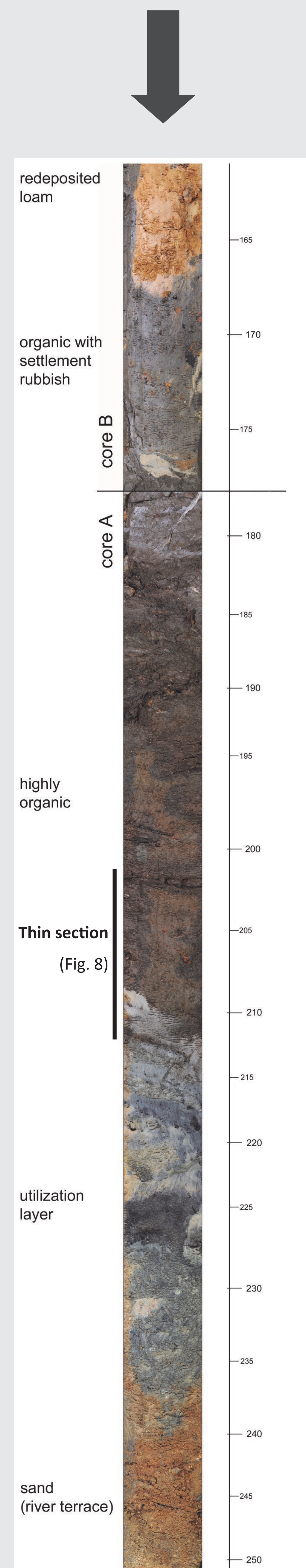


Fig. 7 Cores profiles B and C from the lower part of Well 6.1 (depth measured from excavation level -160 cm)

Thin section (**Fig. 8a**) and archaeobotanical analyses could clarify that well 6.1 remained open for a longer period.

Organic material was accumulated much slower and without disturbances in contrast to a rather short-time process in the lower part of Well 4.1.

This is further supported by radiocarbon dates of Well 4.1 which lie close together. In Well 6.1, however, a succession can be observed (**Fig. 9**).

One of our charcoal-dates (MAMS-11649) shows an obviously too old date (**Fig. 9**). Dates obtained from short-lived plant material are more reliable and were preferred whenever available.

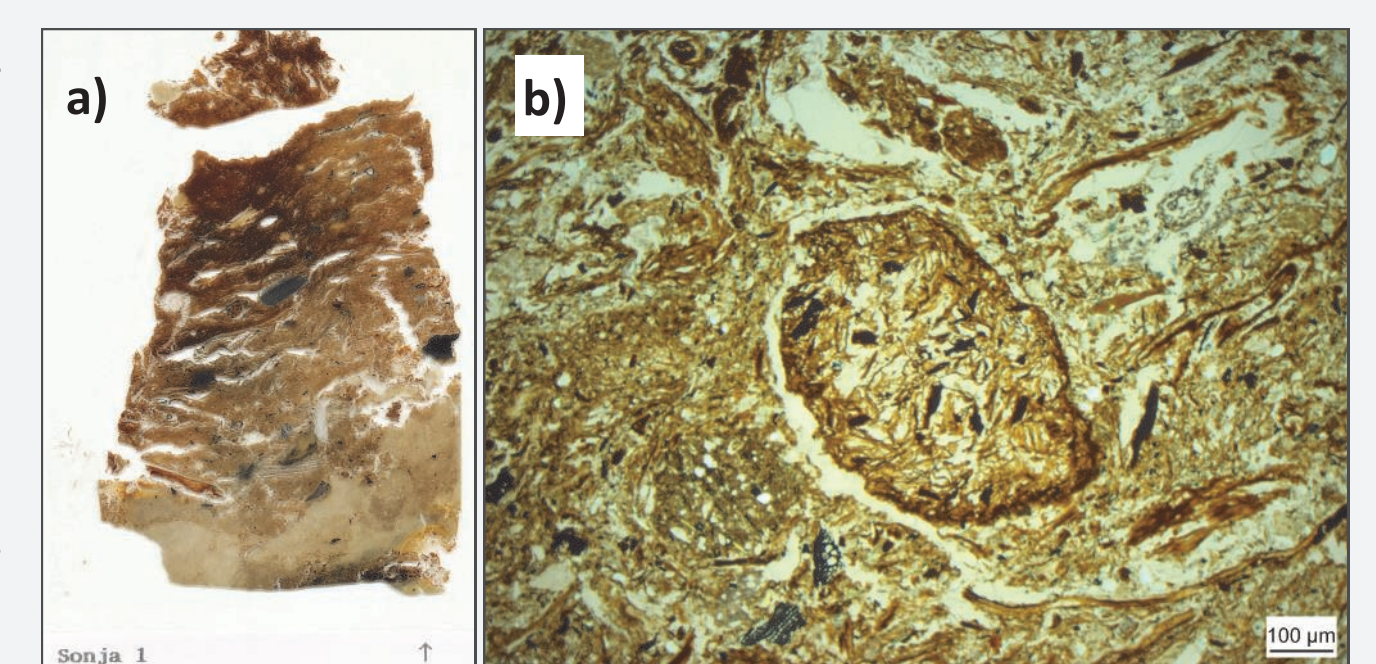


Fig. 8 a) Thin section of the highly organic accumulation above the utilization layer in the lower part of Well 6.1. **b)** Detail of a sheep/goat coprolite (10x).

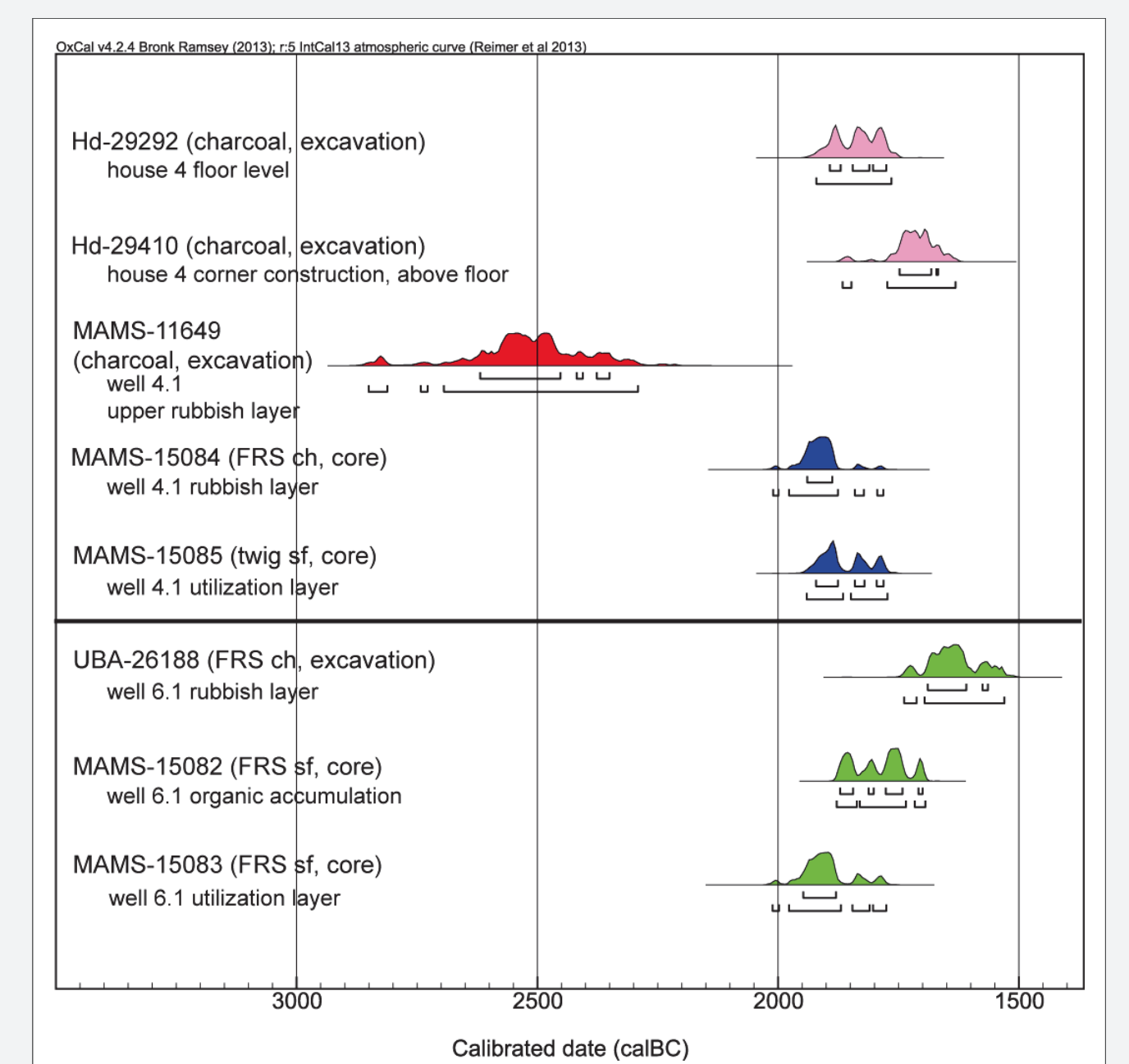


Fig. 9 Radiocarbon dates for House 4 and Wells 4.1 and 6.1 located next to each other (ch charred, sf subfossil, FRS fruits/seeds).

The layers of redeposited loam in Well 4.1 likely represent material that was dug-out during the construction of well 6.1 (or another one) and used to fill up Well 4.1 which was discarded for some reason.

Radiocarbon dates indicate that the time span between the abandonment of Well 4.1 and the construction of the new well might have been short.

Ongoing comparative studies comprise more detailed analyses of construction woods, wooden objects (**Fig. 3**) and other plant remains of about 20 wells. The remains do not only represent natural vegetation but also give hints to plant use within the settlement and will reveal further characteristics like durability of the well constructions and add to the understanding of the settlers' economy and daily life.

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