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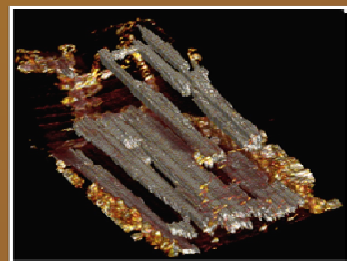
# Building behaviour analyzed by X-rays tomography in two subterranean termite species.

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3D view of chambers in the wood.

*Reticulitermes* species are **subterranean termites** which are found in natural and urban area in Europe. Because of their cryptic life, it is difficult to analyze colony sizes and constructions elaborated in soil and/or pieces of wood, i.e., numbers of chambers, structures elaborated in mud inside the wood, etc. By using **X-rays tomography**, a non invasive medical imaging technique, we were able to perform an original study on these different parameters in the lab.

We analyzed **wood consumption strategies** (volumes of wood eaten, kinetic of consumption, how termites colonized the piece of wood) and **building behaviour** by two termite species, *Reticulitermes grassei* and *R. santonensis*.

## Materials & methods

- 5 different micro-colonies are analyzed for each species
- 900 workers/colony in each plastic box (18 x 12 x 7 cm)
- a piece of wood (pinus: 12 x 4 x 4 cm)
- 2 mm of sand in the bottom

During one year, colonies were analyzed by **X-rays tomography**.

- Parameters : 120 keV, 180 mAs
- Thickness : 0.67 mm
- Increment : 0.33 mm

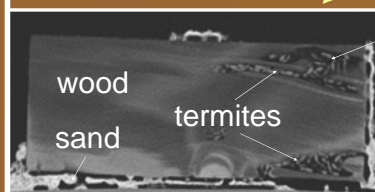


## X-rays tomography

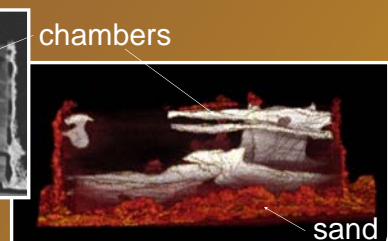
Analyses were performed with a scanner (X-rays tomography).



Data were analyzed with the OsiriX software.



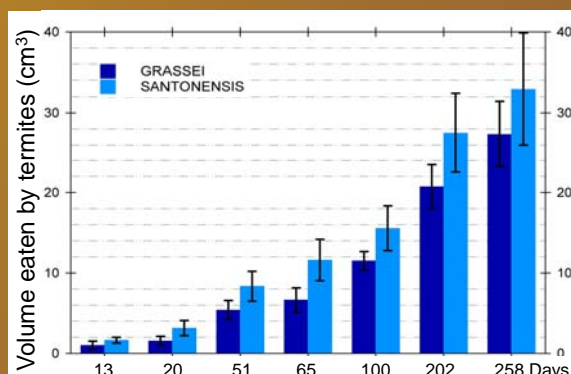
2D view of a piece of wood with chambers containing living termites.



3D view of chambers in the wood

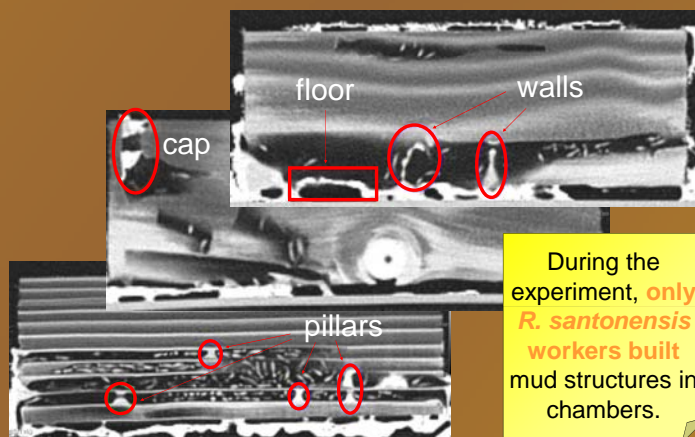
Piece of wood colonized by termites.

## Wood consumption



***R. santonensis* consumes more wood than *R. grassei*** (Mann-Whitney:  $U=440261$ ,  $P<0.001$ ) during 258 days.

## Different structures built in the wood



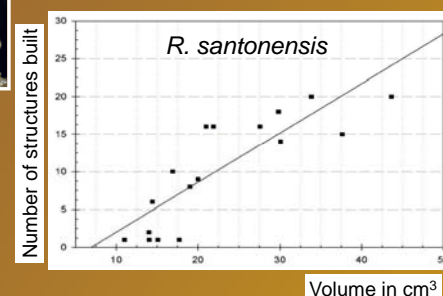
During the experiment, **only *R. santonensis* workers built mud structures** in chambers.

Different mud structures are built inside the chambers in the wood: **caps, pillars, floors and walls**.

## Building behaviour



Worker in action.



The number of structures built in chambers is **correlated** to the volume of wood consumed (Pearson correlation:  $r=0.846$ ,  $P=9.88 \times 10^{-6}$ ).

## CONCLUSION

- X-rays tomography is a fantastic tool to study insects' architectures and building behaviour in continue.
- For the first time, wood consumption and building behaviour of living subterranean termites were observed *in situ* during one year.
- In our conditions, the two species present great behavioural differences, as *R. santonensis* (1) eats more wood than *R. grassei* and (2) is the one who elaborates mud structures inside the wood.
- Our results confirm previous observations than *R. santonensis*, an invasive species introduced in France 300 years ago, makes more damages than *R. grassei*.