Drying profile

The drying rate of wood depends on both the diffusivity of water and the magnitude of the moisture gradient within the wood. Hastening the drying of wood requires increasing one or both of these:

1) **Temperature increase**: Increasing the drying temperature increases the diffusivity of water in wood, so water diffuses along any moisture gradients more rapidly.
2) **Humidity reduction**: Decreasing the humidity of the air surrounding the wood increases the moisture gradient within the wood, again increasing the diffusion rate.

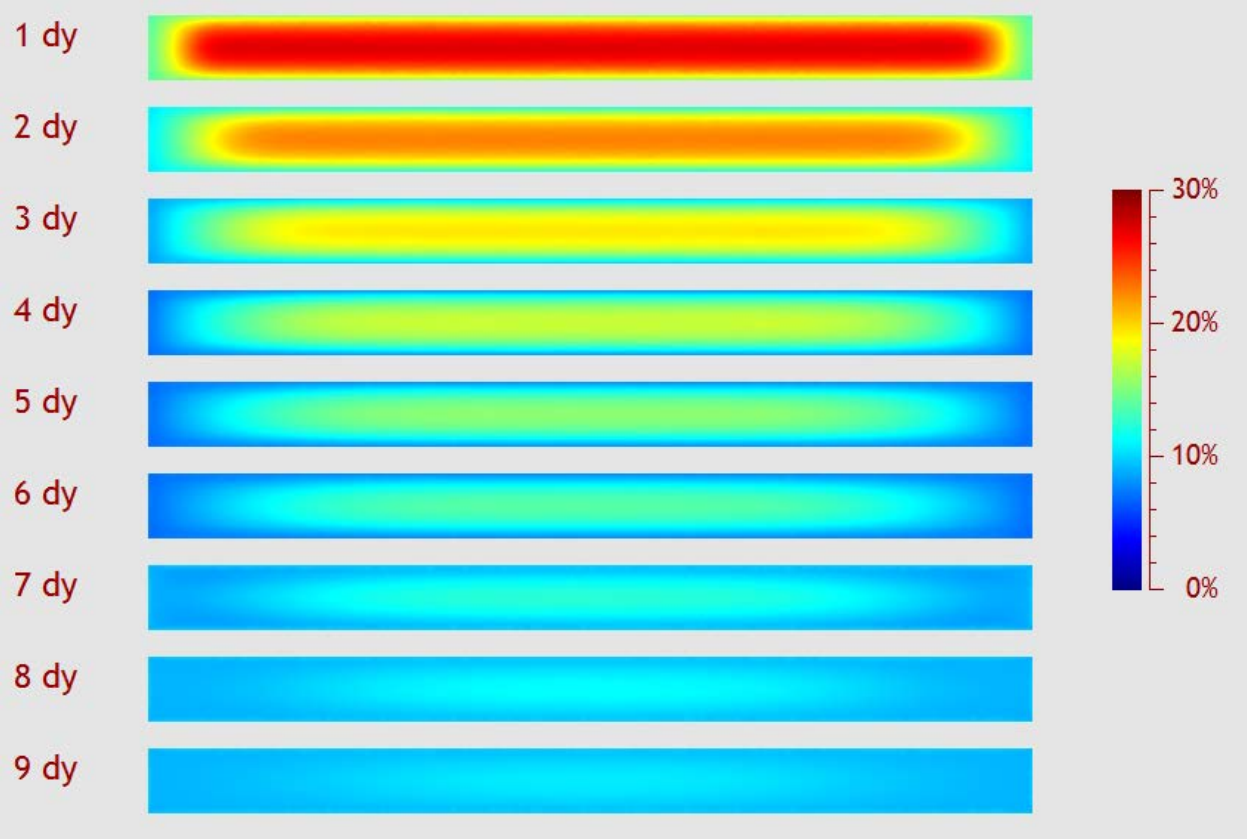
For this experiment, we will simulate a moderately low-temperature drying procedure on oak "sticks" measuring 1.5" × 1.5" × 20". The typical recipe for drying wood is to bring the wood up to drying temperature at high humidity, and then gradually decrease the humidity over time until it is quite low. The wood is "soaked" at that lower humidity level for a length of time sufficient to remove the bulk of the remaining water. After the soak period, the humidity is once again raised in order to restore moisture to the over-dry surface wood. The process is begun at high humidity to avoid a too-severe moisture gradient near the wood surface, which might cause structural failure in the form of surface checks, etc.

Our drying temperature will be 140°F (60°C) throughout the drying process. Our humidity schedule will be as follows:

- Begin at 95% relative humidity,
- linearly lower the humidity to 50% over a period of four days,
- soak at 50% for two days,
- linearly raise the humidity to 65% over a period one day, and
- soak at 65% for two days.

The files for this simulation are `dryingProfile.geo` (geometric model) and `dryingProfile.pro` (diffusion model).

The results of the simulation are shown below:



And here is a time-series view of some of the relevant quantities: