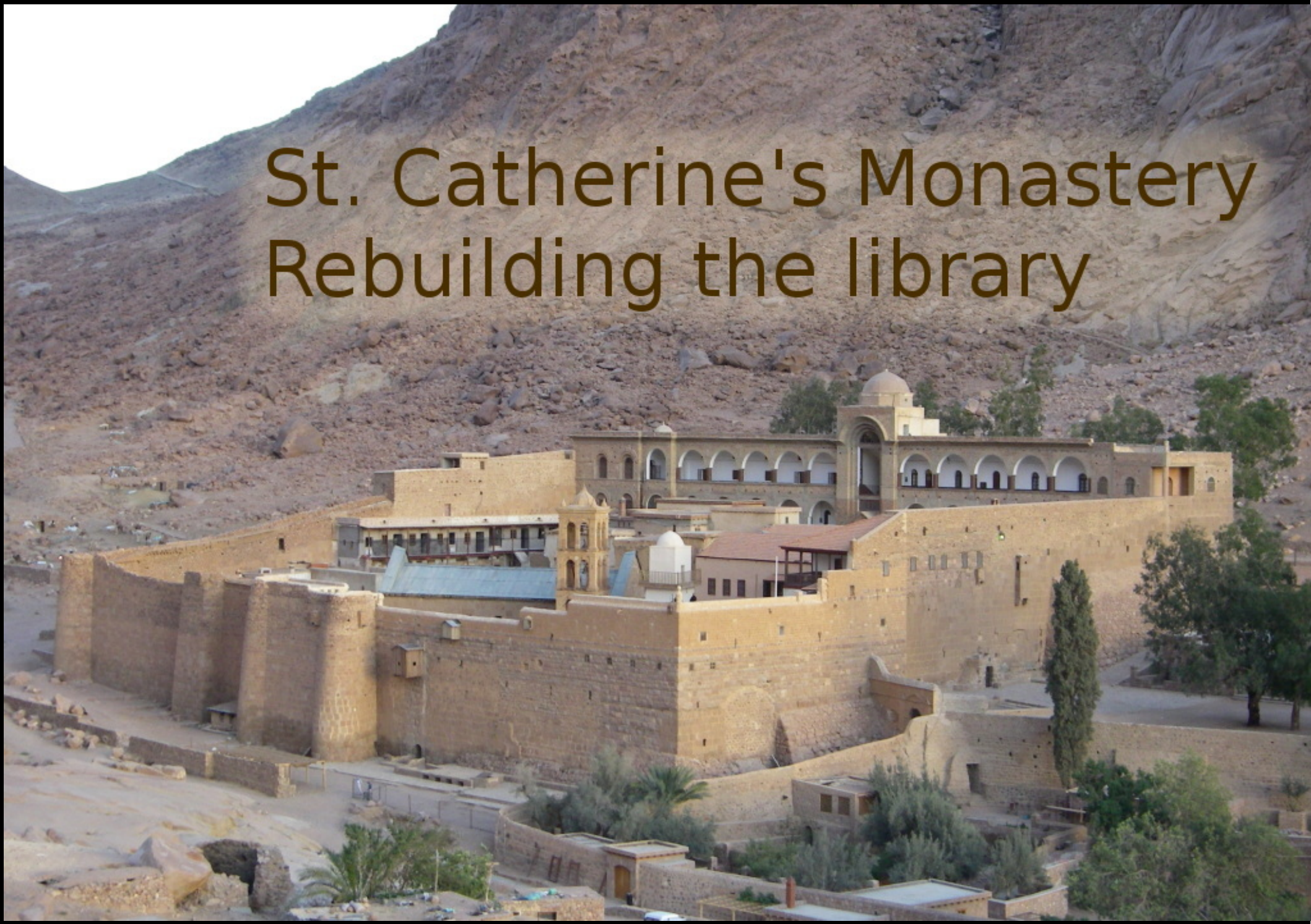
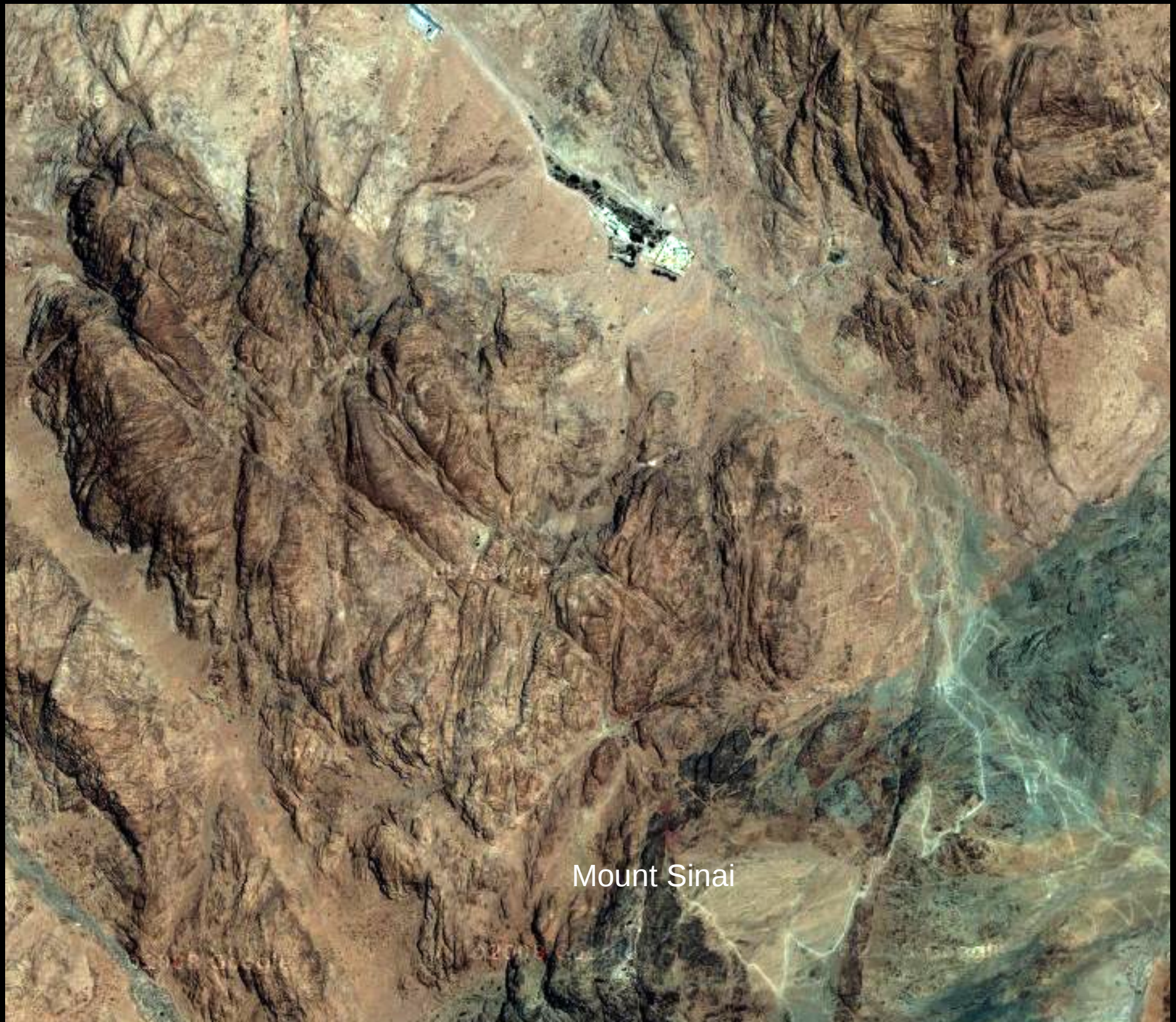


A study of the library climate by Lars Aasbjerg Jensen and Tim Padfield


Mediterranean sea
St Catherine's
Monastery
Sharm el
Sheikh

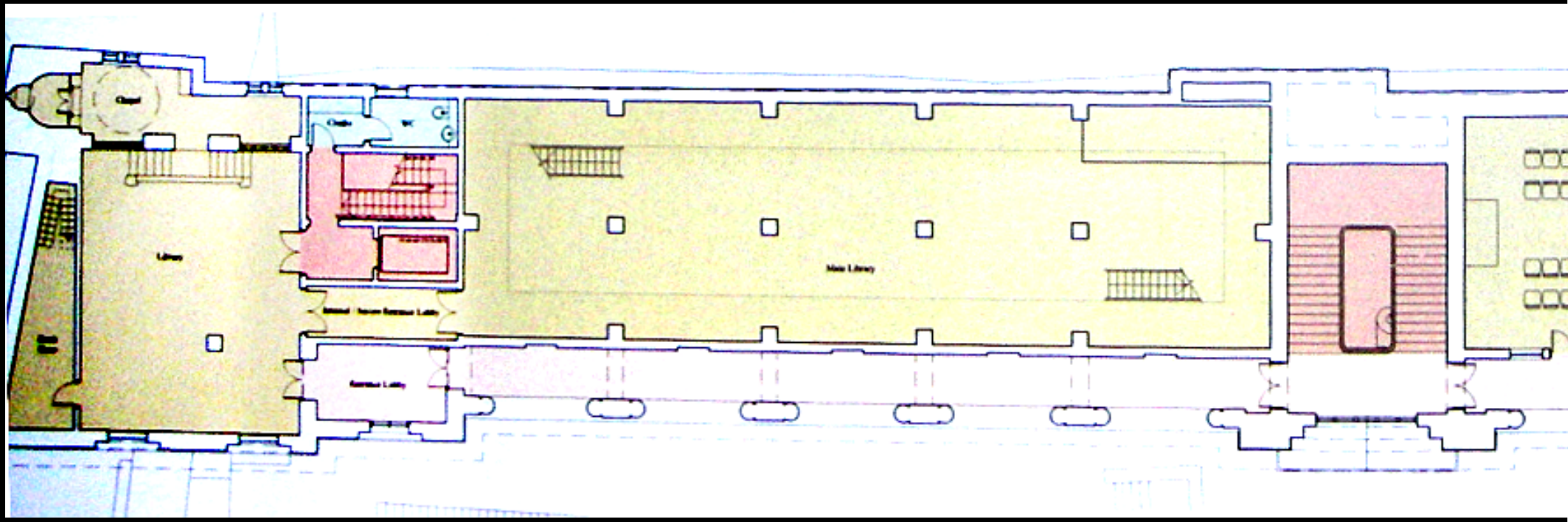

Mount Sinai

St Catherine's monastery viewed from the east

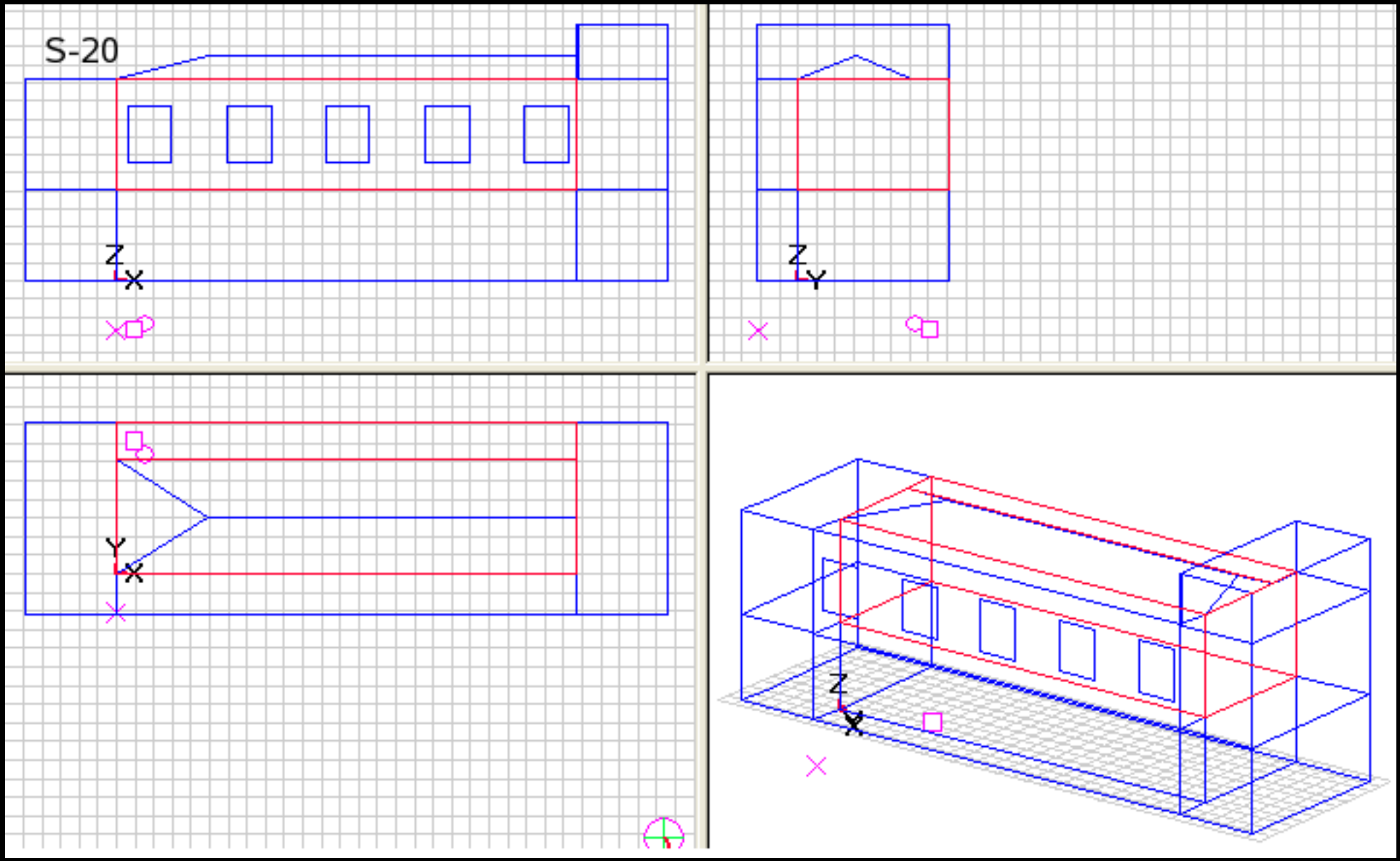
The library is in the top floor of the far wing

The library roof, looking west

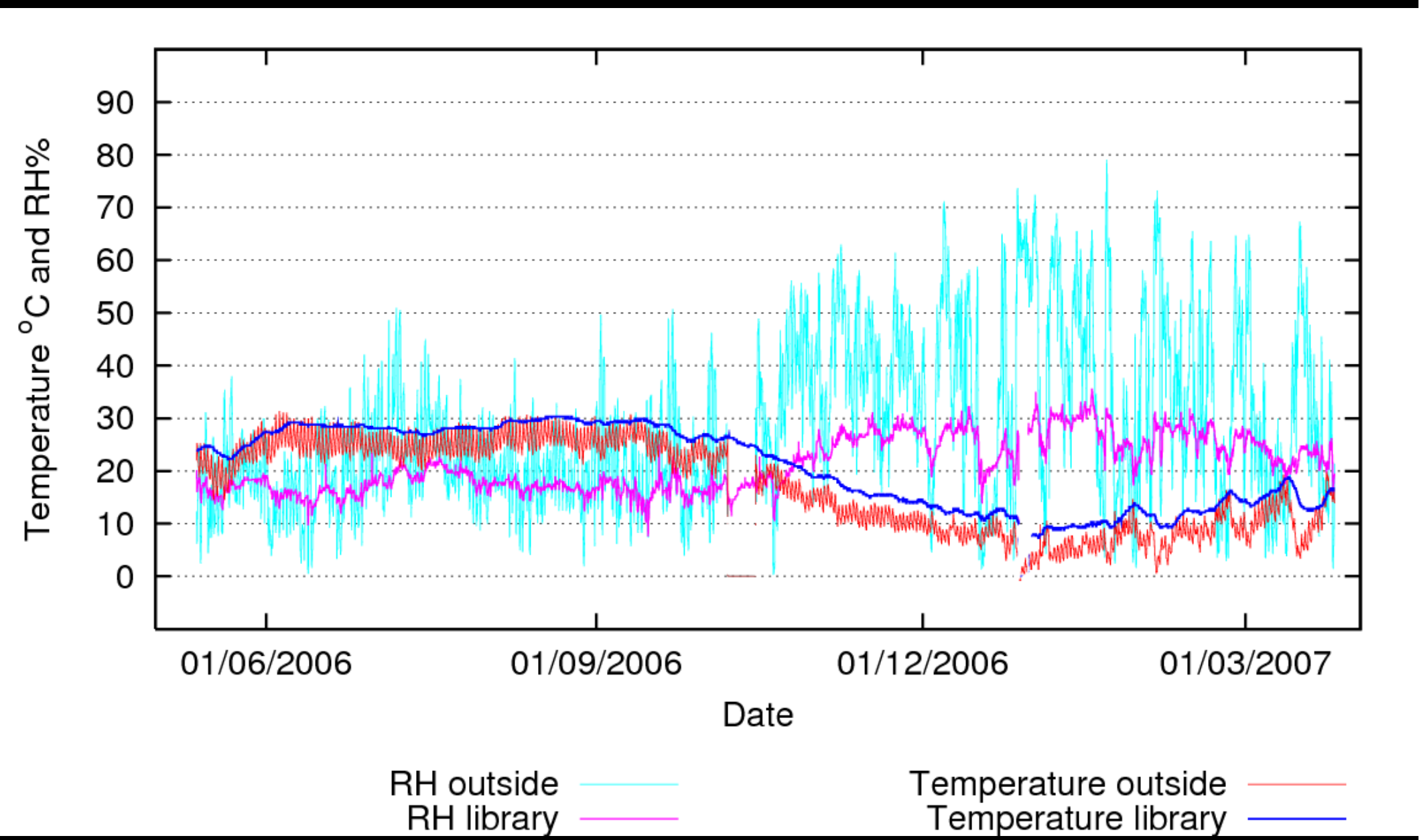
North



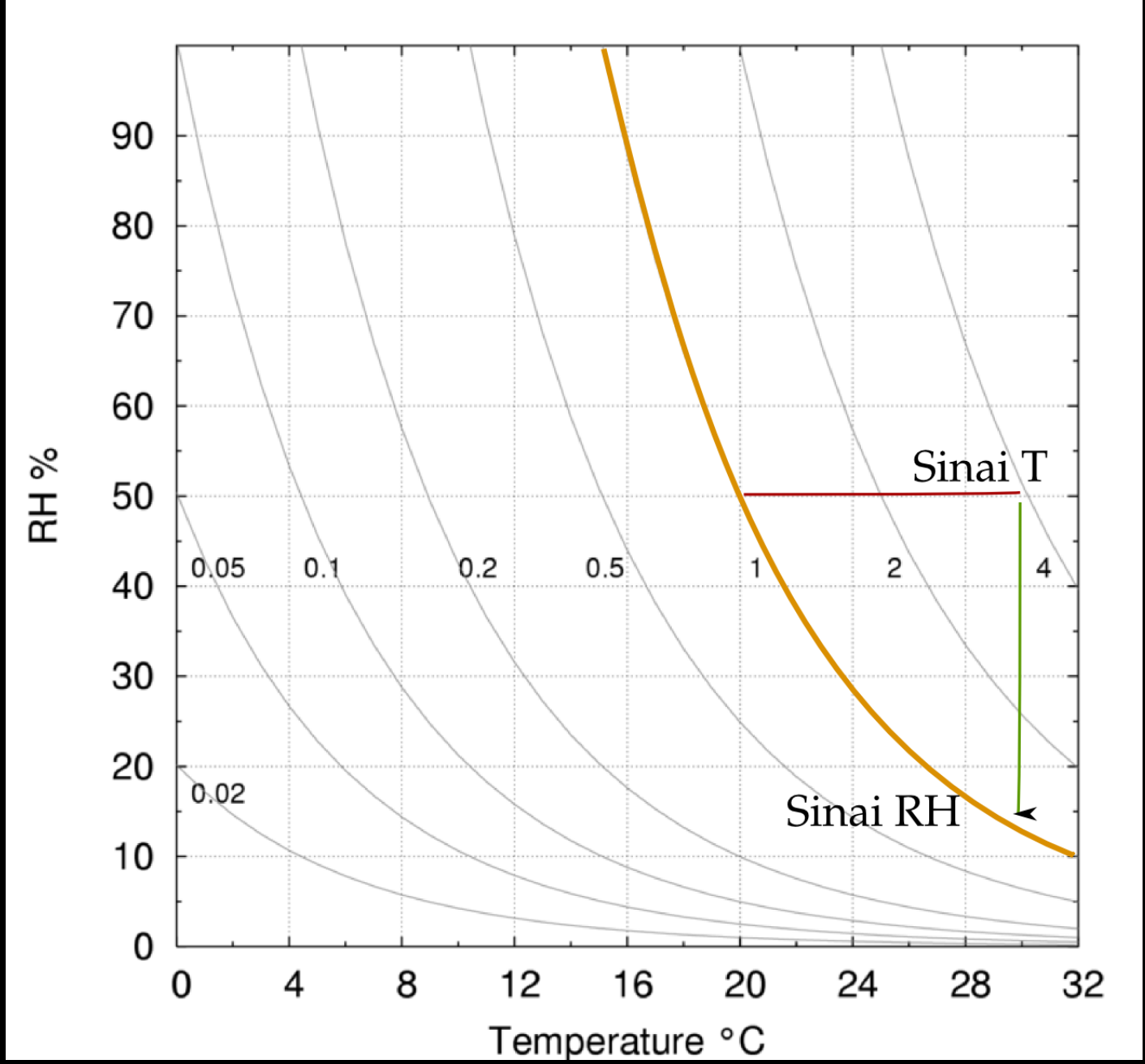
Plan of the proposed library. The main room is about the same size as the existing library, 25 x 7 x 6 m high. Notice the arcade on the north side, which blocks direct sunlight. The south wall is hardly irradiated by the sun, since the summer sun is high in the sky and the winter sun is blocked by the mountains. The main heat source is the roof in summer; the monks' cells below is the winter heat source.



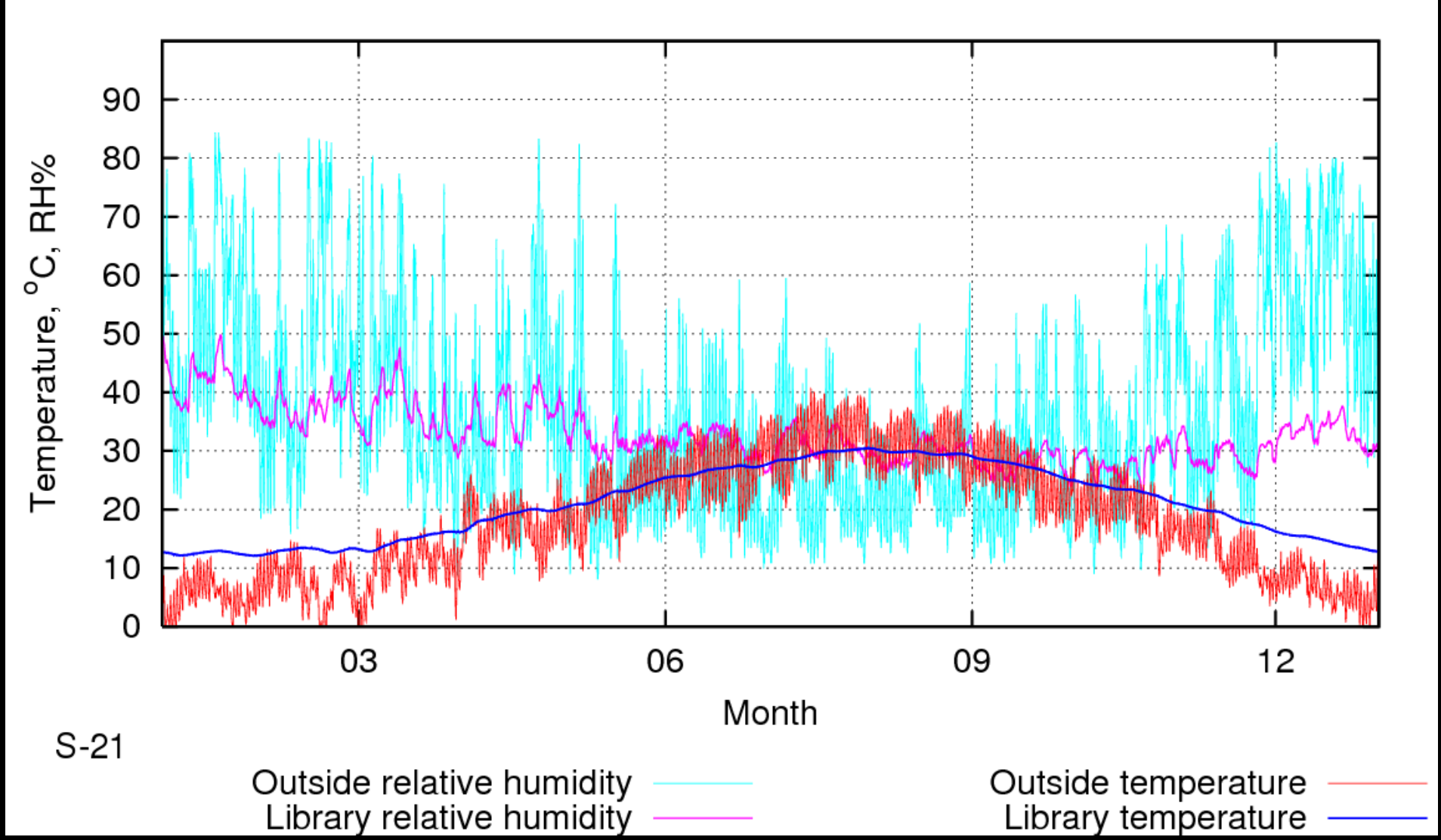
The wire frame model on which the climate predictions are based. The low pitched attic roof proposed by the architect might appear to be a useful sun shade, but the simulations show that a reflective flat roof would keep the library cooler.



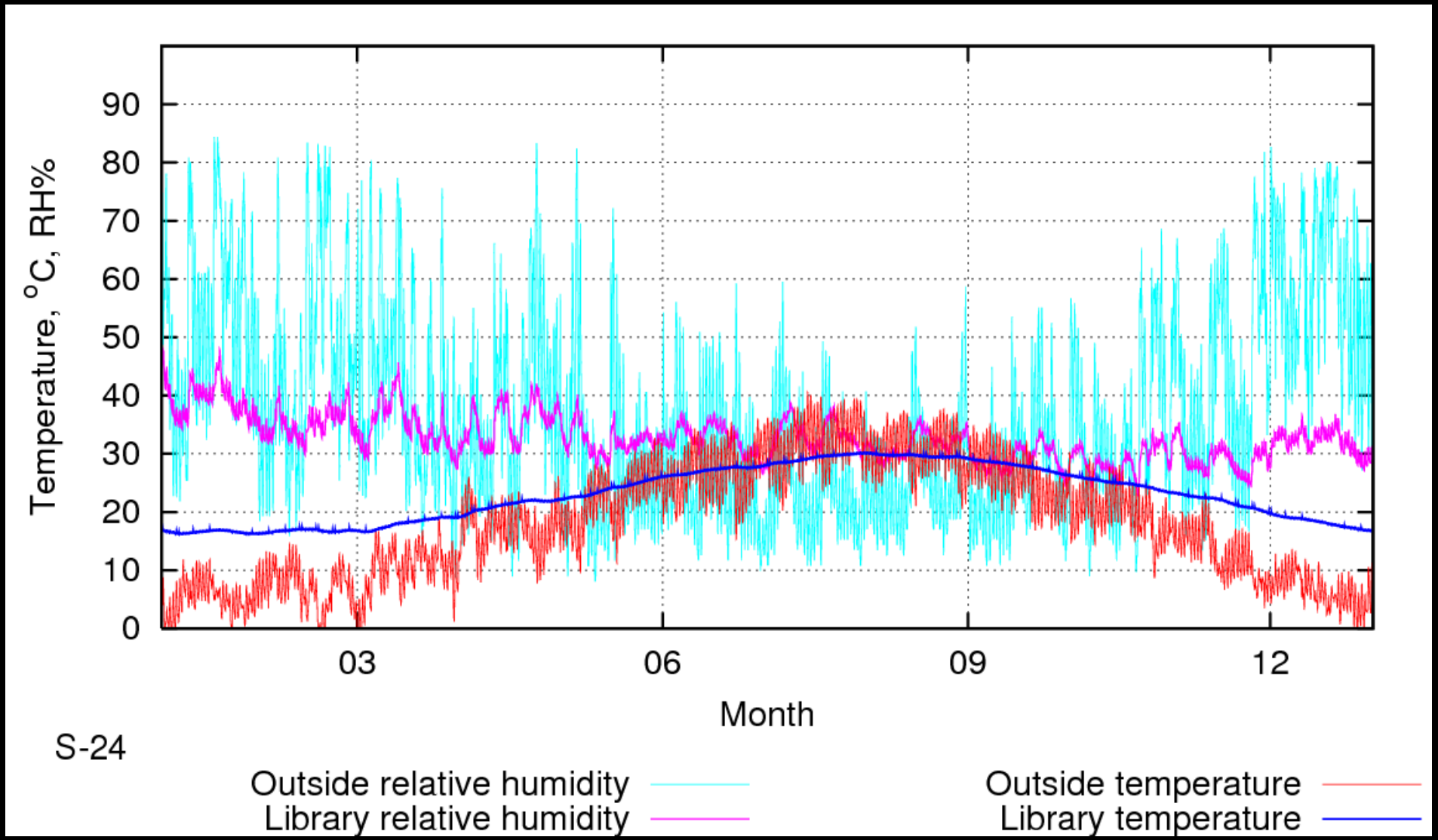
The climate under a shaded arch in the monastery, compared with the climate in the library. Data from Father Justin. His measured outside climate is considerably dryer than the climate data we used in the simulation, which included solar radiation and wind.



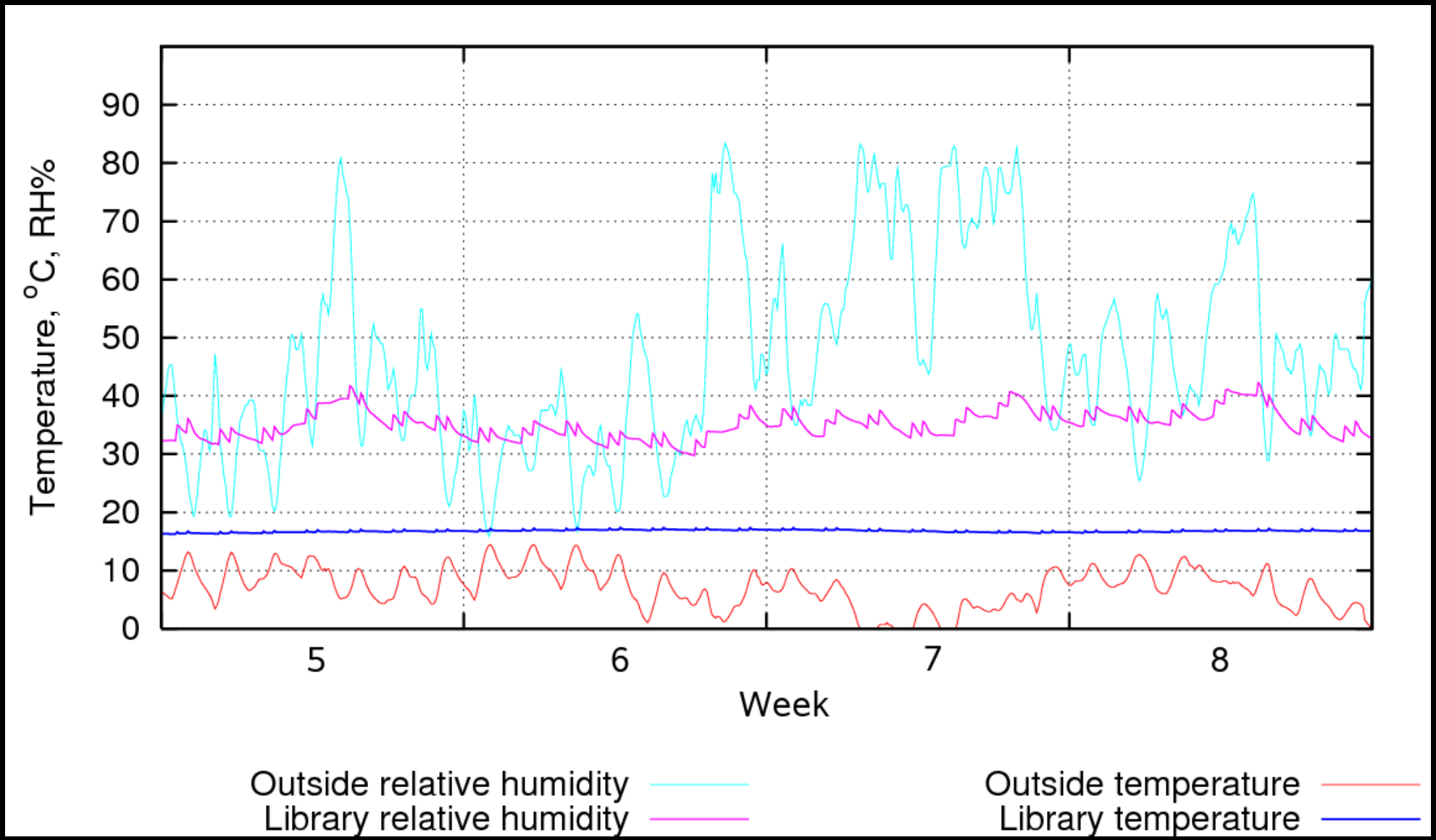
The library climate superimposed on a Sebera type plot of relative reaction rate of a hydrolytic process (the numbers across the middle of the graph), accelerated by both high temperature and high RH.
The low RH in the library compensates for the effect of the high temperature.



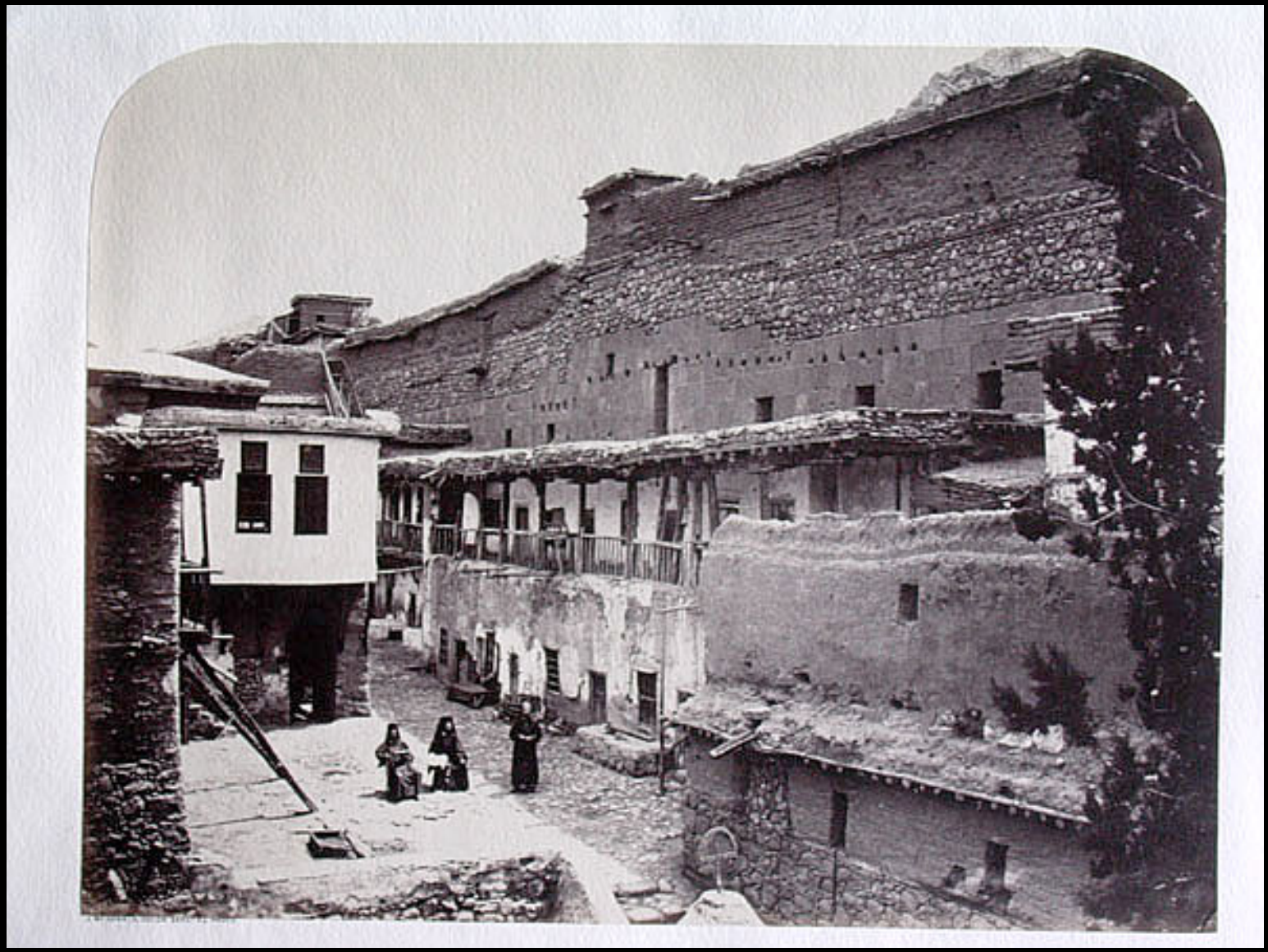
Simulated climate within the library
Construction: pitched roof tiles 0.01 m with 0.05 m polyurethane insulatioon
Ceiling, from top: roof tiles 0.01 m, insulation 0.05 m, concrete 0.1 m, steel 0.002 m.
North wall from outside: render 0.01, brick 0.28 m, render 0.01 m, cellular concrete 0.05 m.
South wall: same as north wall but 0.58 m brick.
Floor: concrete 0.2 m.
Air change rate: 0.1 per hour.



The same simulation as the previous slide but with two sets of 15 visitors every day, staying for one hour. The annual average RH increases by about 3%.



A stretched view of February in the previous graph. The upward blips of RH are caused by the visitors. The temperature is hardly affected.



The old library, set against the granite wall of the monastery. Above that is a medieval wall of blocks set in earth, above that is a wall of earth. The wall was successively raised as attack weapons became more effective.

The books and manuscripts have suffered many unrecorded movements over the fifteen centuries of the monastery's existence but remain generally in good condition.