ANNEX 7.3.2

SIX-MONTH REPORT ON

CLIMATE, MICROCLIMATE AND ENVIRONMENTAL DIAGNOSTICS

NATIVITY CHURCH - GELATI MONASTERY - GEORGIA

REPORTING PERIOD: JANUARY – JUNE 2026

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Client: Gelati Rehabilitation Provisional Committee

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1. SCOPE

Based on the mandate established by Contracts No. 25 (Prof. Dario Camuffo), 26 (Dr. Antonio Della Valle) and 27 (CMR Lab srl), of 21th November 2025, this report presents the interpretation of the microclimate monitoring performed during the first 6 months of 2026 (from January to June) with the advanced monitoring system installed in the Nativity Church, Gelati Monastery.

Details of the advanced monitoring system are provided in a previous report, Annex 7.3.5, dated 30 January 2026.

2. SENSOR LOCATION

The figure below shows the locations of the monitoring sensors within the church, as represented in the east and south sections. The indoor air-temperature and relative-humidity sensors are positioned at the dome (sensor 3), the upper and lower mosaic levels (sensors 4 and 5), the lower part of the church (sensor 6), and the entrance room area (sensor 7). The corresponding surface-temperature probes monitor the dome, the mosaic at different heights, the entrance room masonry and the floor, while the outdoor sensor provides the external reference conditions used for comparison.

3. PHYSICAL MEANING OF ATMOSPHERIC VARIABLES

RELATIVE HUMIDITY

Relative Humidity (RH) is a parameter that represents the degree of saturation of water vapour (not the saturation of air!), i.e. if the vapour is close to, or far from saturation.

When saturation is exceeded some H_2O molecules are removed from the system by condensation.

RH is the ratio between the actual partial pressure *e* of the water vapour and its saturation vapour pressure $e_{sat}(t)$ at the same temperature *t* (°C) and pressure (hPa), expressed in percent (%) of the saturation value.

$$RH = 100 \frac{e}{e_{sat}(t)}$$

RH changes when the moisture content, the temperature, the volume of the air parcel, or the ambient pressure change.

As the denominator $e_{sat}(t)$ is an exponential, it is not mathematically correct to perform arithmetic calculations, like daily or monthly averages. A representation in terms of frequency or percentiles is preferable and recommended.

MIXING RATIO

The mixing ratio of moist air is the ratio of the mass of water vapour m_{H2O} to the mass of dry air m_{N2+O2} in which H_2O molecules are dispersed.

This ratio represents the ponderal mixture of these two gaseous substances, i.e, H_2O and (N_2 + O_2) as well as the ratio between their number of molecules, i.e. n_{H2O} and n_{N2+O2}

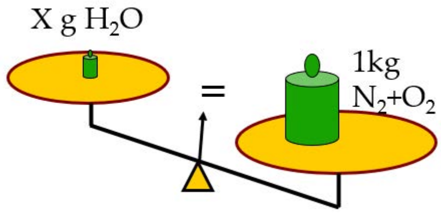
$$MR = \frac{m_{H2O}}{m_a} = 0\ 0.622 \frac{n_{H2O}}{n_{N2+O2}}$$

The Mixing Ratio (MR) can be calculated from Temperature (t) and Relative Humidity (RH) values, provided the barometric pressure p (hPa) is known, using the following formula:

$$MR = 38.015 \times \frac{10^{\frac{7.65t}{243.12+t}} \times RH}{p - \left(0.06112 \times 10^{\frac{7.65t}{243.12+t}} \times RH\right)} \ (\mathrm{gkg}^{-1})$$

MR is a fingerprint of any air parcel because it is invariant to changes in air temperature, pressure and volume. It may change only if water molecules are added (evaporation, perspiration) or subtracted (sorption, condensation), or mixing occurs with drier or moister air.

This makes possible to recognize exchanges, sources and sinks of moisture.



From the above definitions, Mixing Ratio can be interpreted as a parameter that gives the number N of H_2O molecules mixed with 1000 molecules of dry air, i.e. MR = k N/1000 (where k is a proportionality coefficient)

Let us consider a building, and compare the MR values inside and outside, i.e. MR_{in} = k N_{in} /1000 and MR_{out} = k N_{out} /1000.

Three cases are possible:

1. **MR_{in} = MR_{out}** , i.e. **N_{in} = N_{out}** . When N is the same inside and outside the building, neither condensation nor evaporation occurs.
2. **MR_{in} < MR_{out}** , i.e. **N_{in} = N_{out} – C**. When inside the building the MR is lower than outside, this means that a number C of H_2O molecules has been removed from the external air by **sorption or condensation** on internal walls, or the floor.
3. **MR_{in} > MR_{out}** , i.e. **N_{in} = N_{out} + E** . When inside the building the MR is higher than outside, this means that a number E of H_2O molecules has been added to the external air **by evaporation from walls** or **perspiration from people**.

DEW POINT (°C): The temperature of condensation

The dew point temperature, DP, is the temperature to which a parcel of moist air **reaches saturation** (at constant temperature and pressure).

Simply speaking, DP is a characteristic temperature of any air parcel: **the temperature threshold for condensation**. Let us consider a surface with temperature T_S

When **T_S > DP** **no condensation is possible;**

When **T_S = DP** **equilibrium threshold, in which evaporation = condensation**

When **T_S < DP** **condensation occurs on the surface**

On a surface, condensation may occur **only when its temperature T_S drops below DP.**

NOTE. It should be noted that wall efflorescence or contamination by soluble salts can cause **water sorption by deliquescence** at some critical RH levels. This is another mechanism of physical chemistry, that should not be confused with condensation.

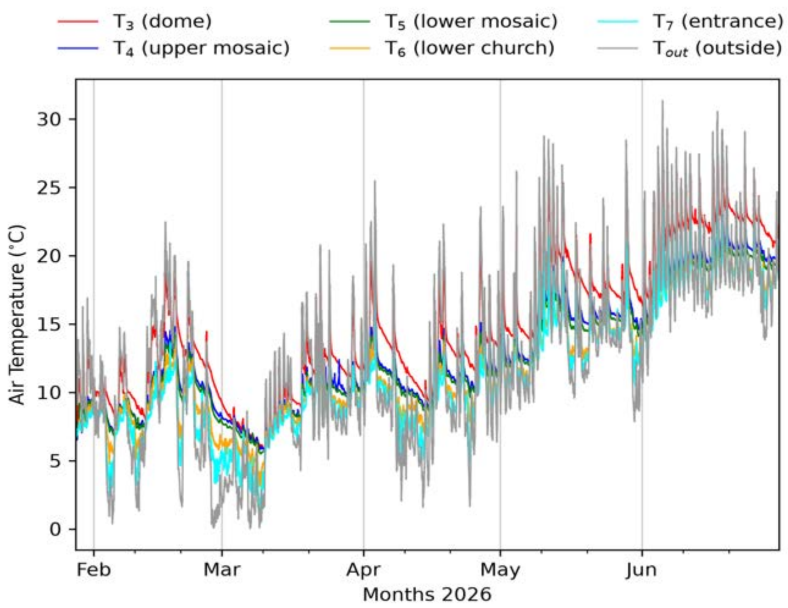
The Dew Point Temperature (DP) is calculated from Temperature (t) and Relative Humidity (RH) values, using the following formula:

$$DP = \frac{243.12 \times \ln\left(10^{\frac{7.65t}{243.12+t}} \times \frac{RH}{100}\right)}{17.62 - \ln\left(10^{\frac{7.65t}{243.12+t}} \times \frac{RH}{100}\right)} \ (^{\circ}\mathrm{C})$$

4. DATA ANALYSIS

Air temperature

Air Temperature (°C) – All sensors



The overview points out some characteristic features:

All sensors show strictly connected values with the same turning points, but trends differently smoothed.

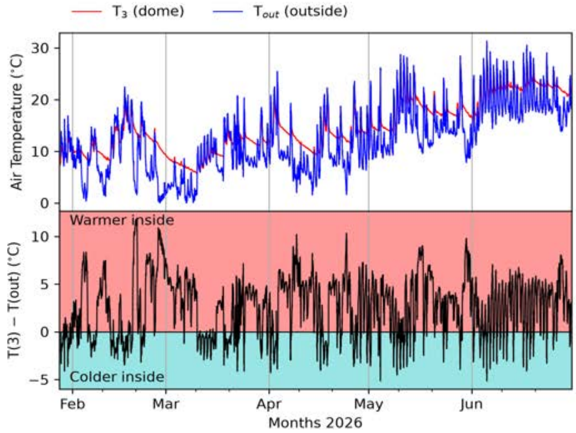
The external air temperature (Tout) has a wider range than the internal ones, reaching higher temperatures during the day and lower temperatures during the night.

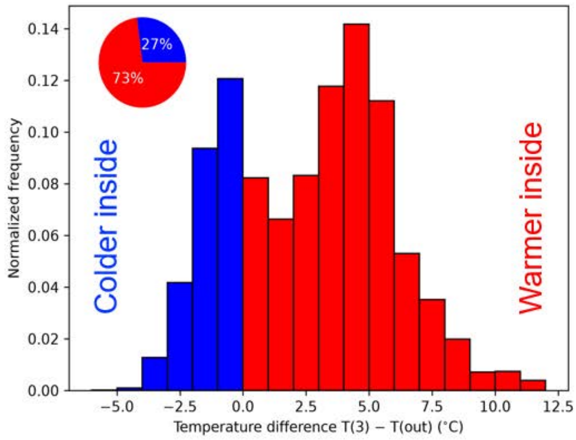
The indoor air temperature extremes are mitigated by the building frame.

The indoor air has a strong temperature layering with the highest to the lowest value in the following order: dome (T3), upper mosaic (T4), lower mosaic (T5), lower church (T6), and entrance room (T7).

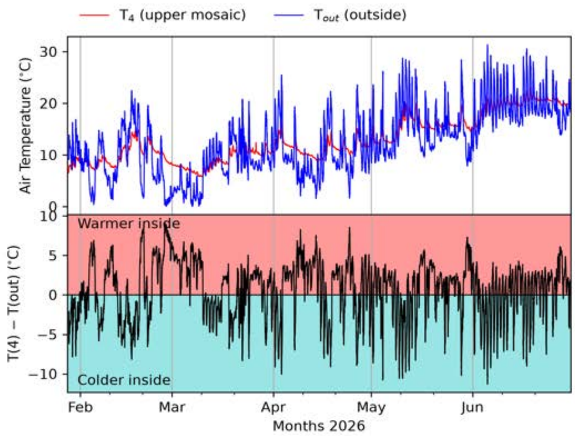
In the following plots, the upper panel shows a comparison between the indoor the outdoor temperatures, while the lower panel and the histogram quantify the temperature differences and their frequencies. Comments follow each group of related plots.

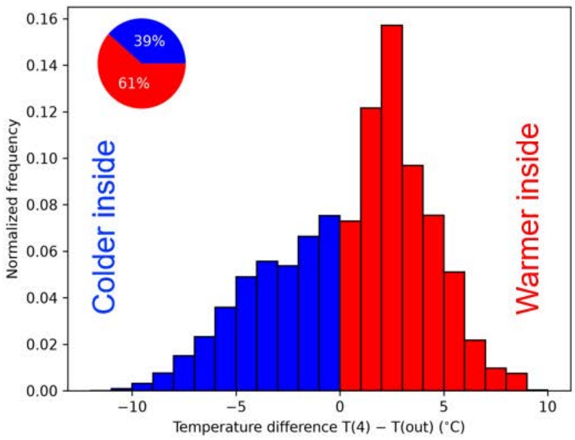
Air Temperature – Dome (sensor 3)



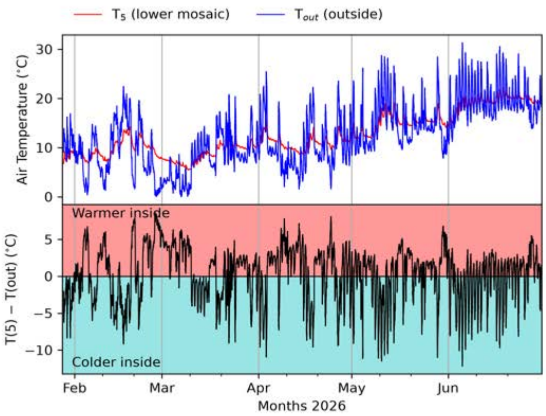


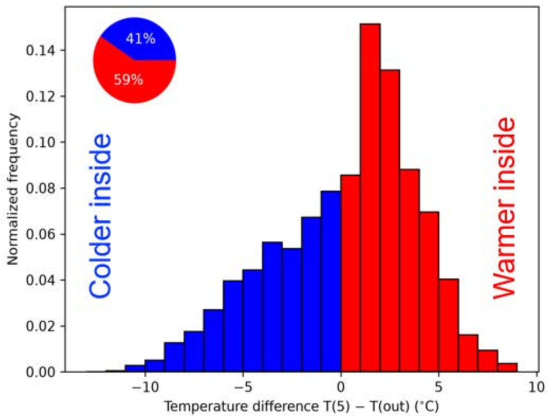
Air Temperature – Mosaic (sensor 4)



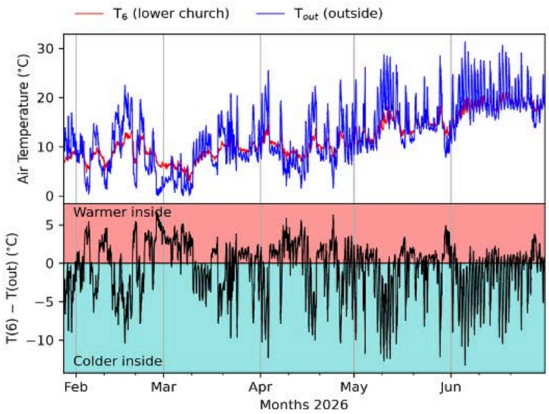


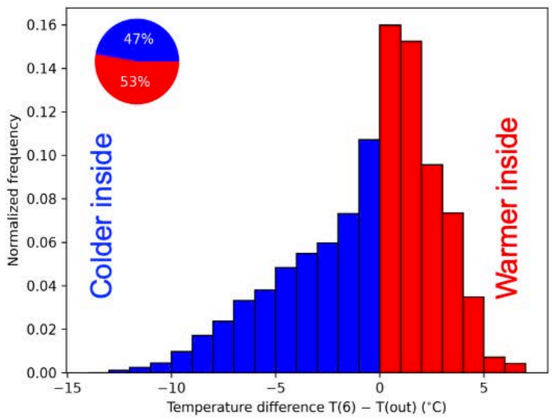
Air Temperature – Mosaic (sensor 5)



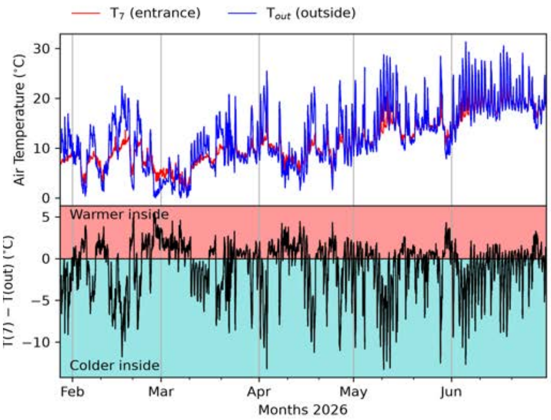


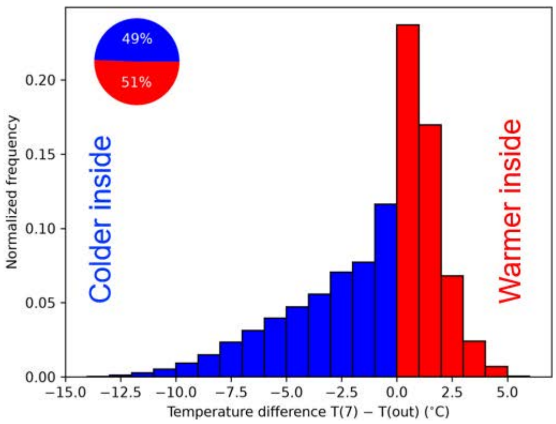
Air Temperature – Lower church (sensor 6)





Air Temperature – Entrance room (sensor 7)

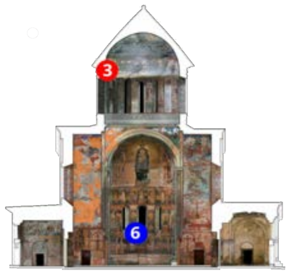


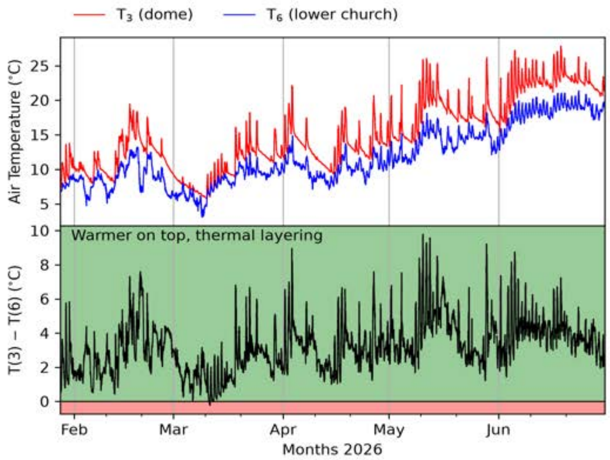


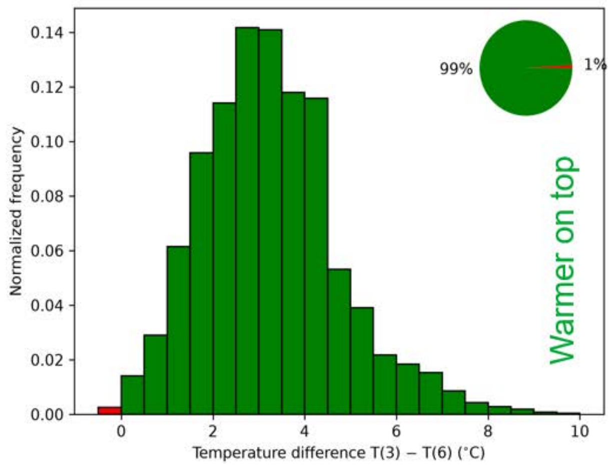
The dome temperature (T3) is higher than the external temperature for 73% of the time, i.e. for a longer period than the lower levels. At the entrance room the indoor temperature is higher than outdoors for the shorter time, i.e. 51% of the time. However, the indoor temperature exceeds the outdoor one up to 5°C as a maximum, while it remains below the external temperature up to -12.5°C.

The cold inside, due to the thermal inertia of the floor and walls which follows the natural warming or the growing season with delay, may be responsible for some condensation on the floor and cold surfaces as discussed later.

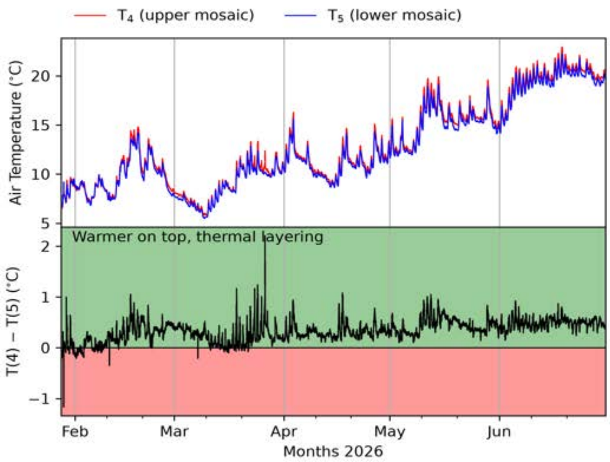
Thermal layering – dome (3) vs lower church (6)

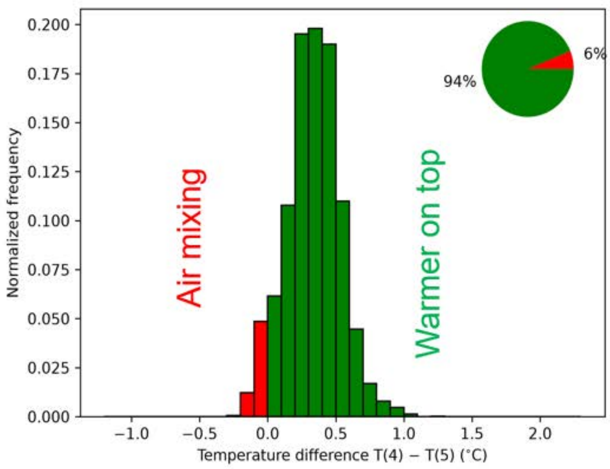






Thermal layering – mosaic



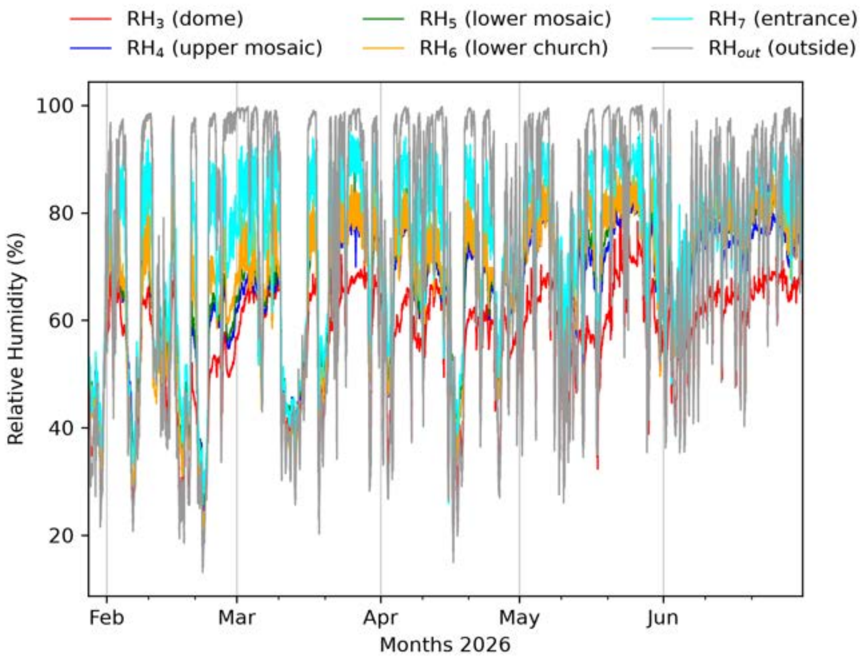


All the graphs showing the difference of temperature between an air level and a lower one show positive values for 94-99% of the time. Internal layering is the most stable situation. Vertical mixing is only exceptional, and might be related to specific events, like opening of doors and windows.

The dome-to-lower-church difference is generally several degrees and confirms a persistent vertical temperature gradient. In contrast, the difference between the upper and lower mosaic levels is much smaller, showing that the air around the mosaic is nearly homogeneous over that limited height range.

Relative Humidity

Relative Humidity – all sensors

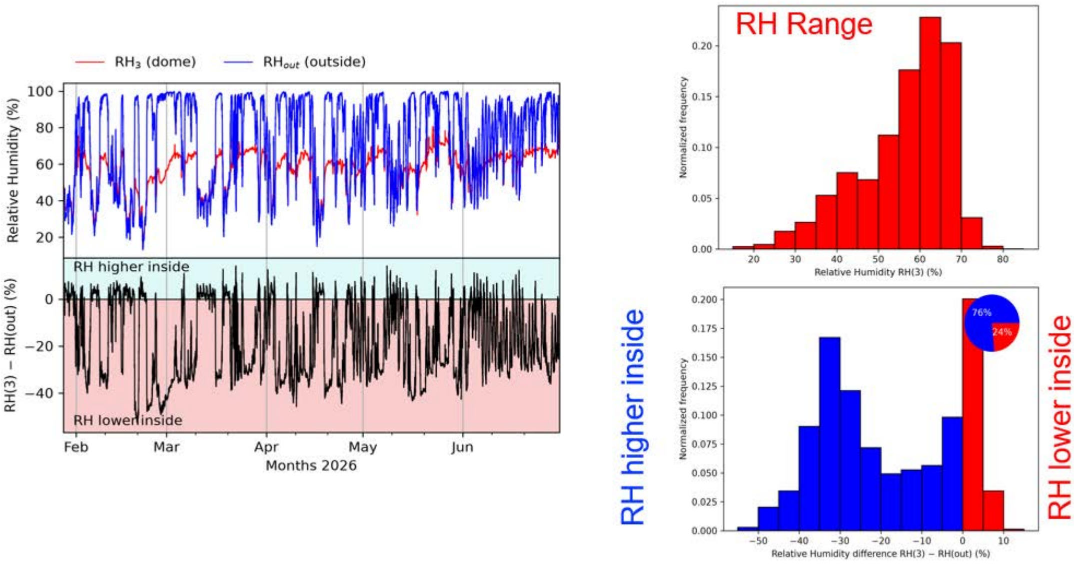


It should be membered that RH is a very important physical variable for conservation, but poorly useful for environmental diagnostics purposes, because it is physically determined by the air temperature and the mixing ratio, and the results can be interpreted only making reference to such primary variables.

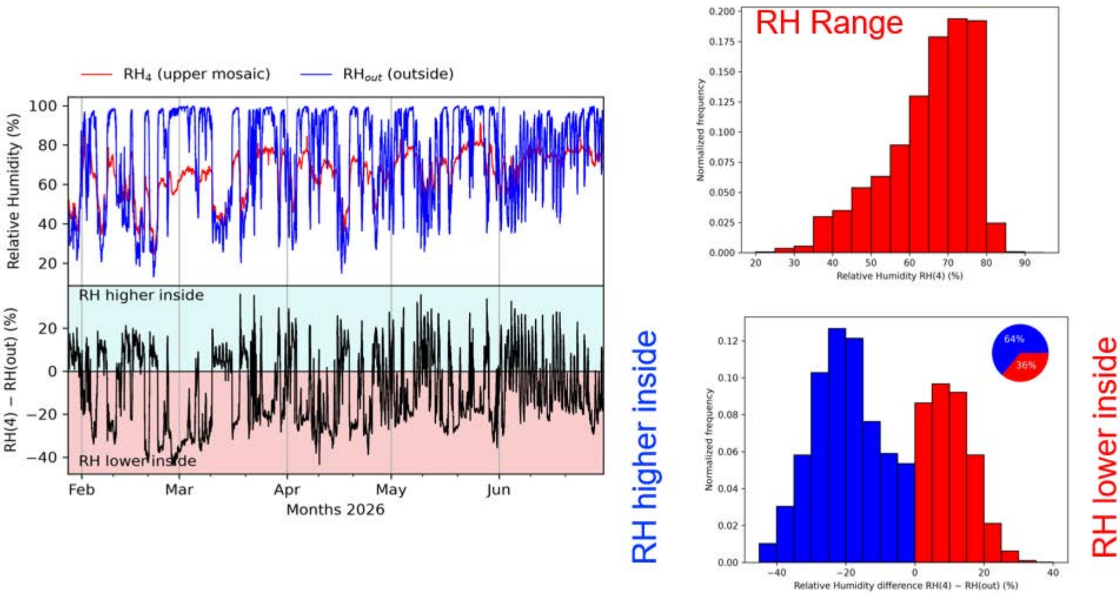
The outdoor RH range lies from saturation (100% RH) to extremely dry (10-20% RH) conditions with extreme daily variability.

The indoor RH range is narrower and much more stable, with small daily variability.

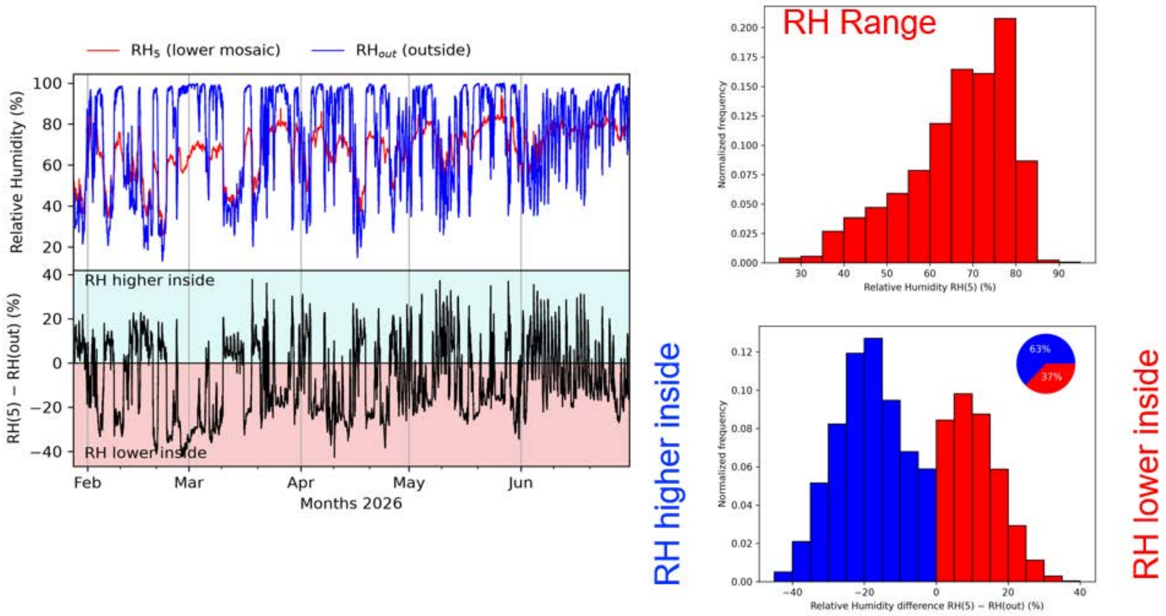
Relative Humidity – Dome (sensor 3)



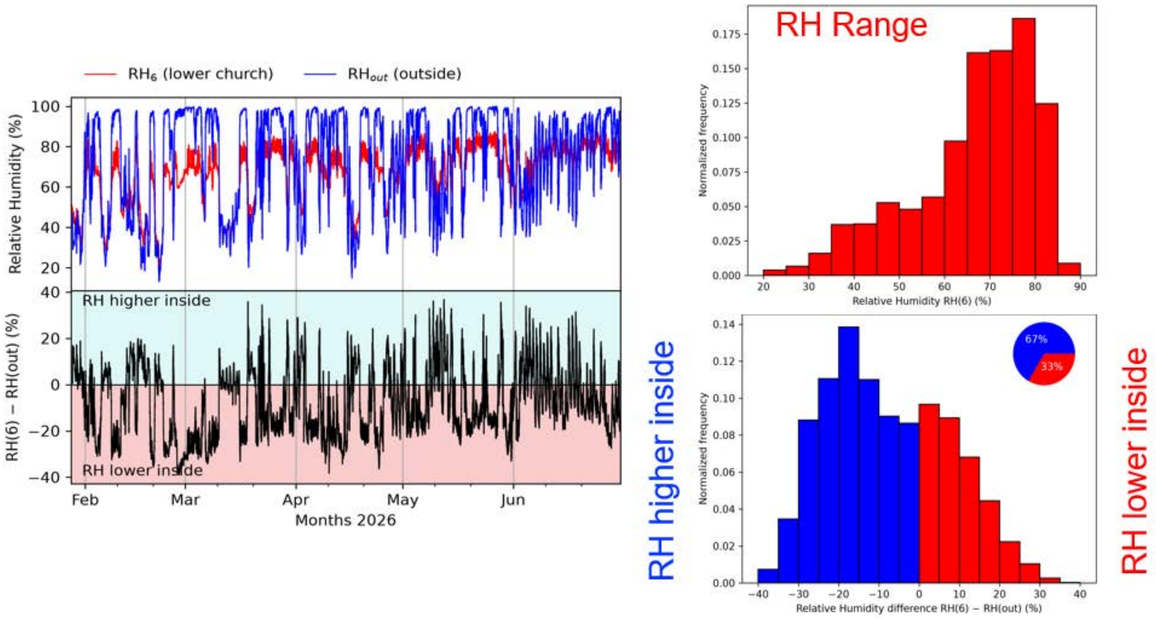
Relative Humidity – Mosaic (sensor 4)



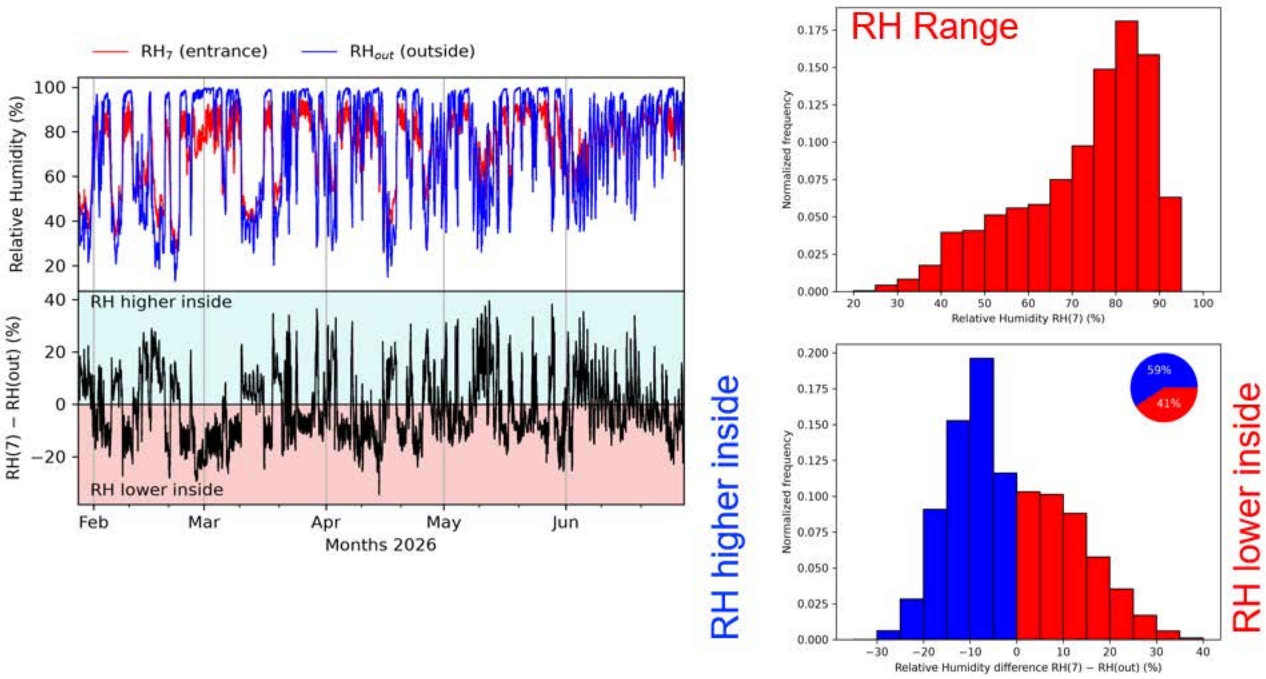
Relative Humidity – Mosaic (sensor 5)



Relative Humidity – Lower church (sensor 6)



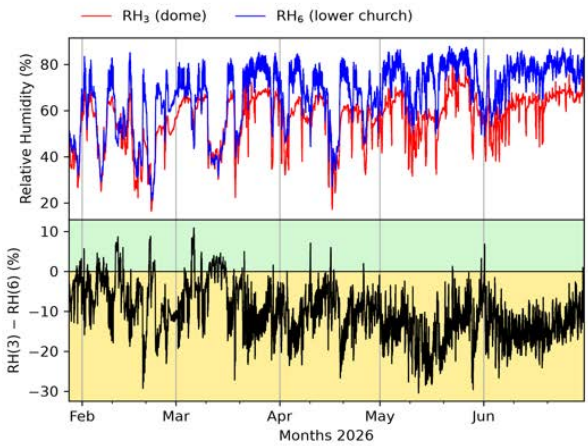
Relative Humidity – Entrance Room (sensor 7)

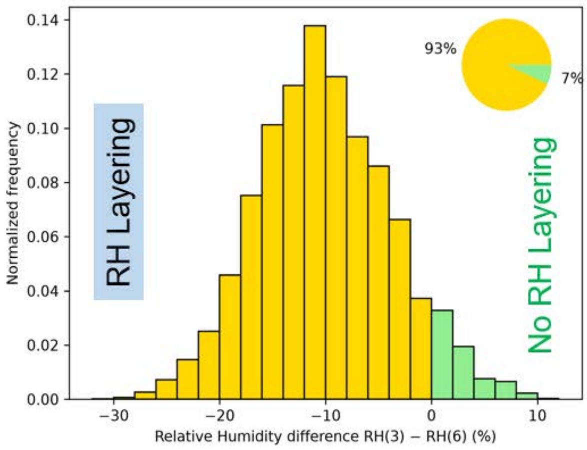


At all levels, the most humid conditions (in terms of RH) are lower than the outdoor values, but the maximum values decrease with the height. The range at the entrance room (RH 7) is 20-95%; the lower church (RH 6) 20-90%; the lower mosaic (RH5) around 25-85%; the upper mosaic (RH4) 25-85%; the dome (RH6) 15-80%.

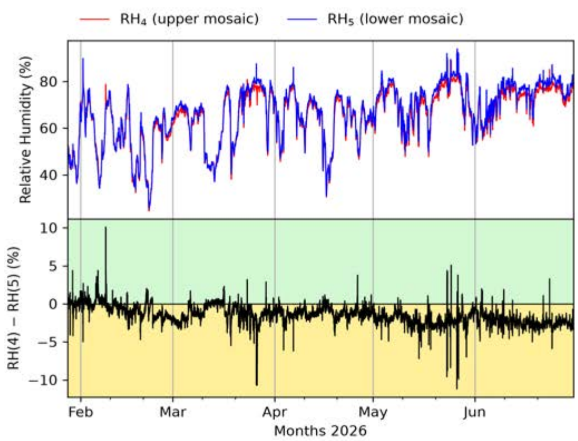
The frequency distributions show a progressive shift towards higher RH values at the lower levels, especially near the entrance room and the floor. Conversely, the dome is characterized by lower RH because of its systematically higher air temperature.

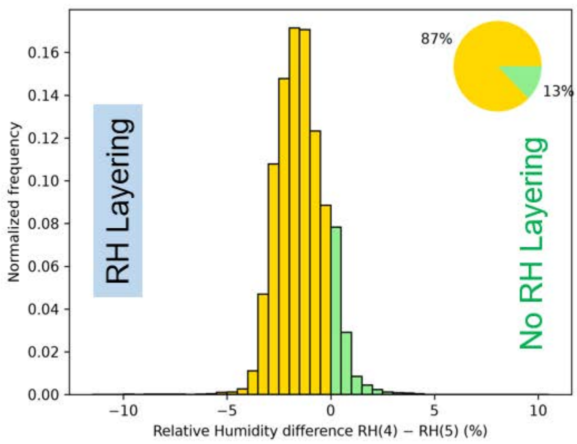
RH layering – dome (3) vs lower church (6)





RH layering – mosaic



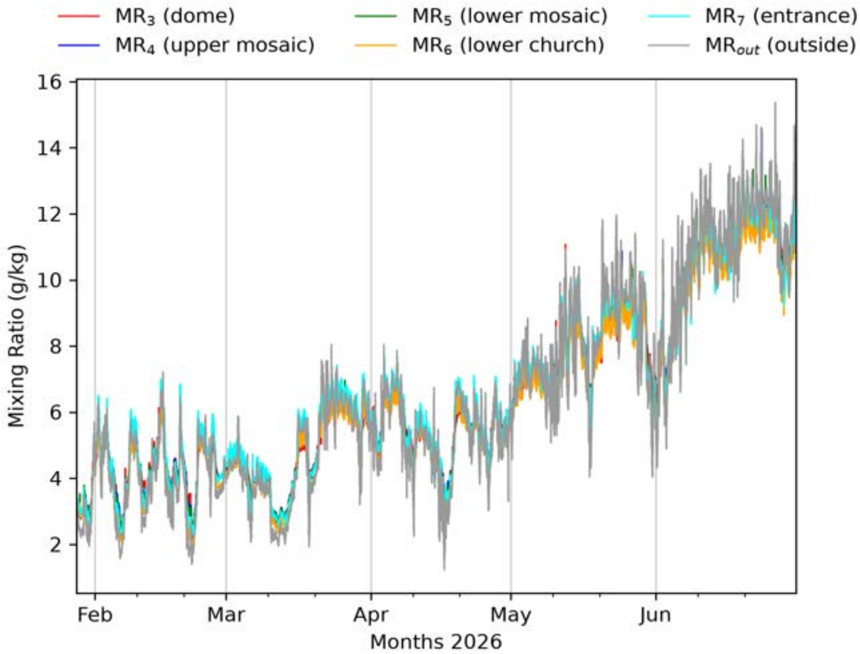


Considering that the MR is homogeneously distributed along the vertical, the decrease of RH with the level is strongly governed by the increase in temperature. The temperature layering is responsible for the apparent RH layering.

At all levels, in the dryest conditions, the inside RH is some 10% more than the external one.

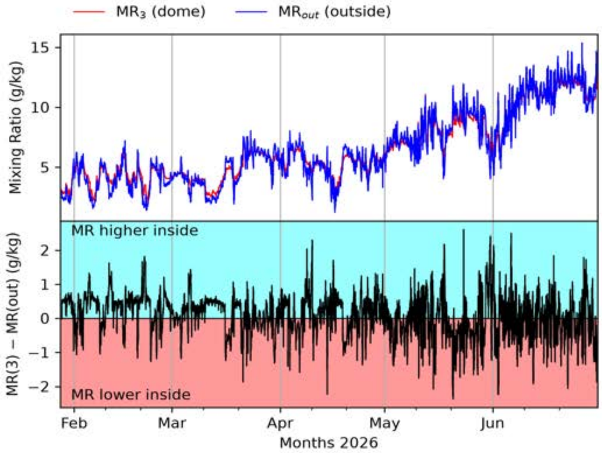
Mixing ratio

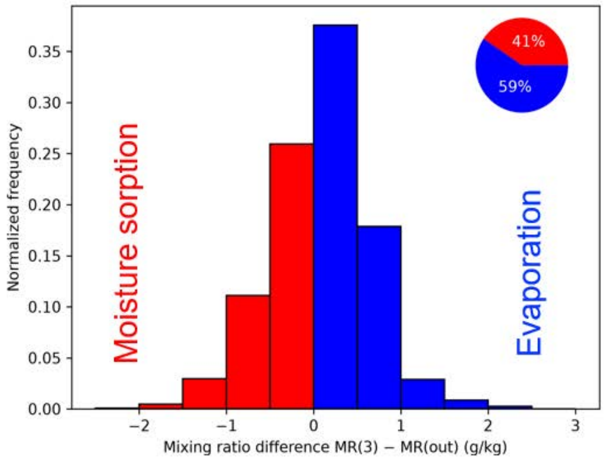
Mixing ratio – all sensors



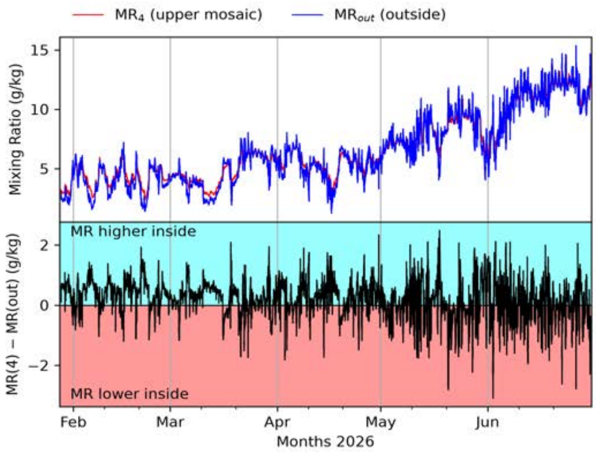
All sensors show strictly connected MR values with the same turning points and trends, but with slightly different values, with departures of some 1 g/kg between them.

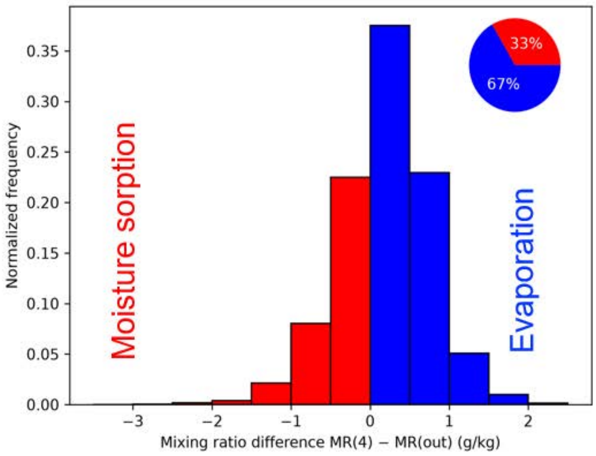
Mixing ratio – Dome (sensor 3)



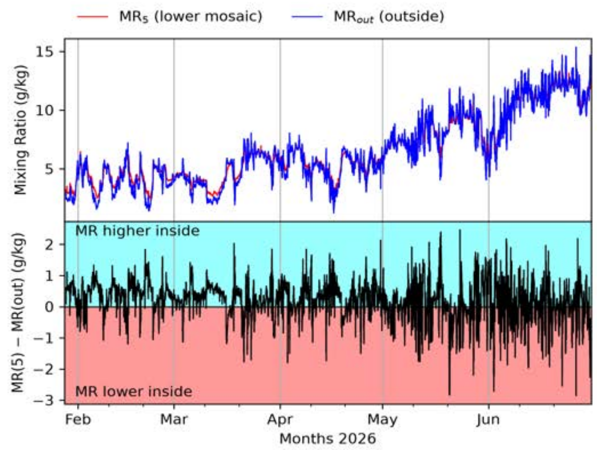


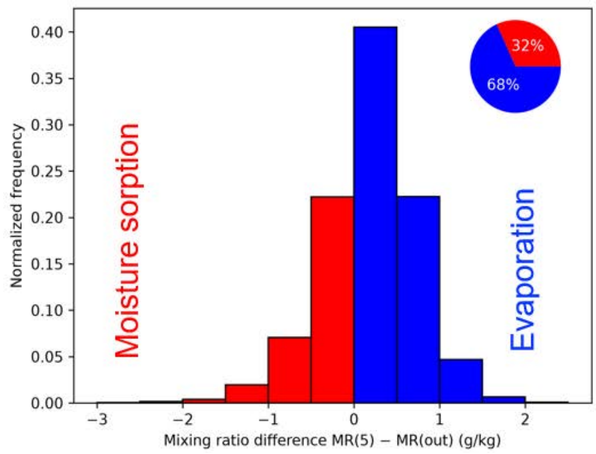
Mixing ratio – Mosaic (sensor 4)



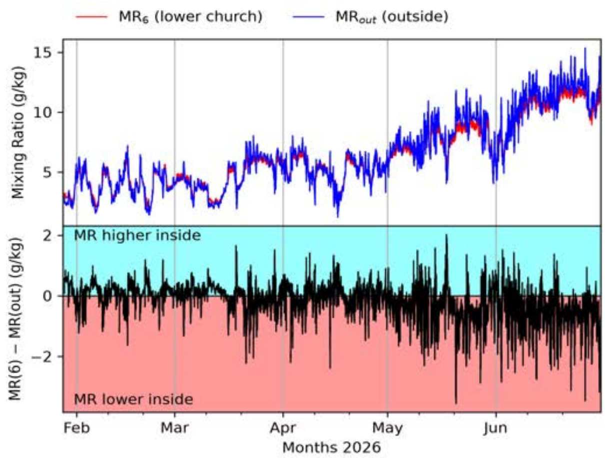


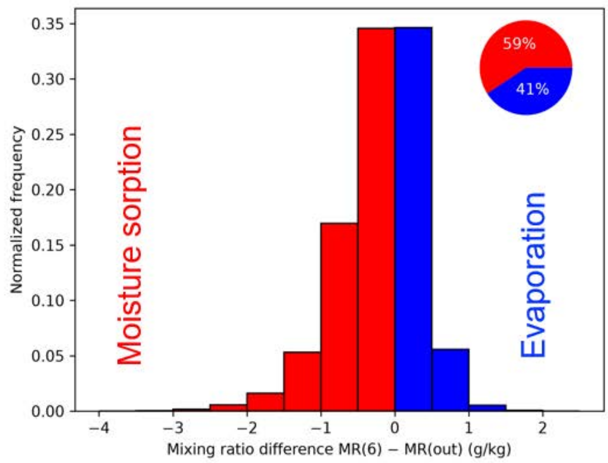
Mixing ratio – Mosaic (sensor 5)



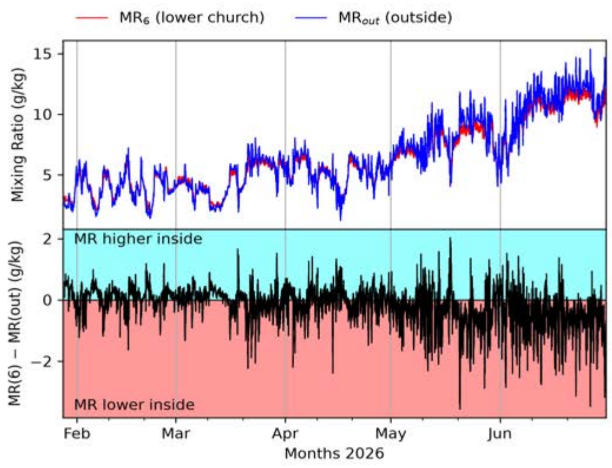


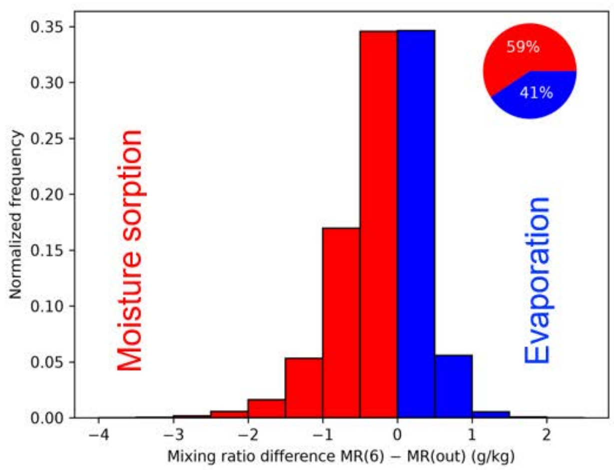
Mixing ratio – Lower church (sensor 6)





Mixing ratio – Entrance room (sensor 7)





The indoor measurement at the dome (MR3) shows values close to the outdoor sensor (MR_{out}), but with some small differences: for 59% of the time the inside value is slightly larger (that might be explained with some evaporation occurring indoors), and for 41% of the time is slightly lower (that might be explained with some moisture sorption or condensation occurring indoors).

The same situation is found at the other sampling points, except that in the lower church (MR6) in May 2026 when a temporary, slight tendency for moisture sorption or even condensation is visible, possibly for some activities inside.

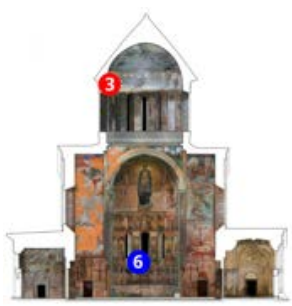
We will see later, with the combined surface temperature and dew point analysis, that condensation on mosaic and walls is excluded, and the physical mechanism is due to moisture absorbed by masonry, inside micro porosities (Kelvin effect) and hygrophilic materials.

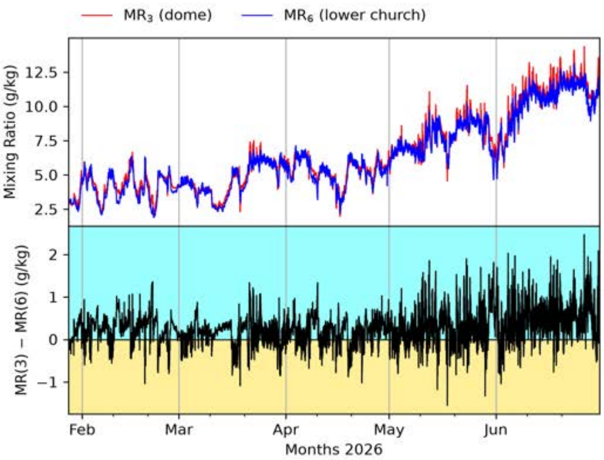
The differences within ±1g/kg, either positive or negative, are close to the limit of uncertainty of the combination of the four sensos involved in the calculation and are not at significant level.

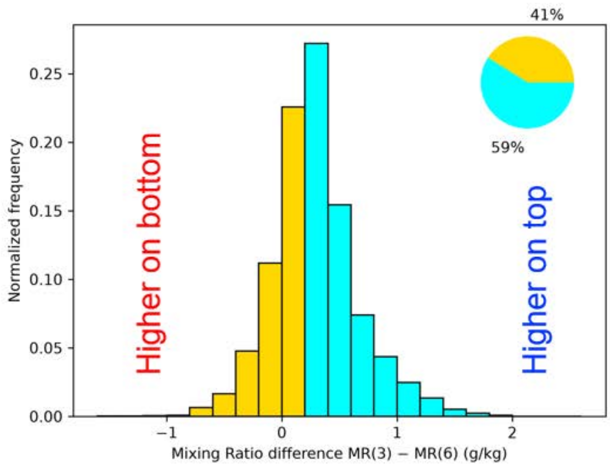
The 2026 situation shows a substantial improvement in comparison with the situation in 2024, and 2025, when the positive values exceeded the negative ones for over 90% of the time, and with significant differences up to 4 g/kg. In 2024-2025 the evaporation was dominant, now the masonry has reached a better equilibrium.

The individual histograms are centred close to zero, confirming that indoor-outdoor moisture differences are generally small. The alternating positive and negative sectors describe successive periods of small evaporation and small moisture uptake rather than a continuous one-directional moisture flux.

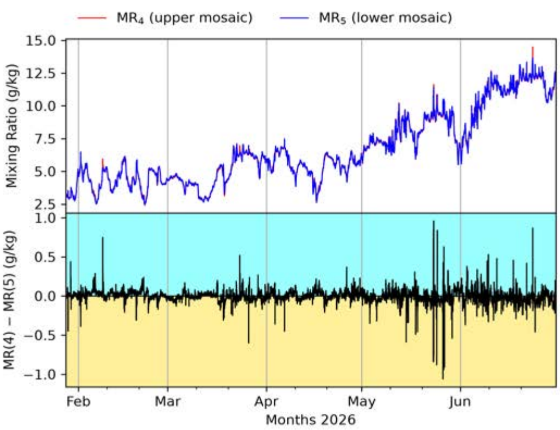
MR layering – dome (3) vs lower church (6)

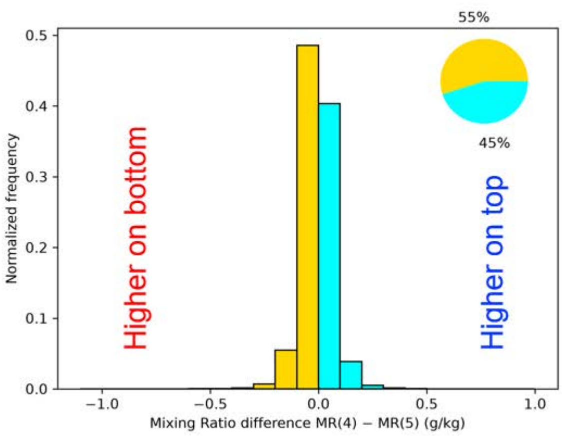






MR layering – mosaic

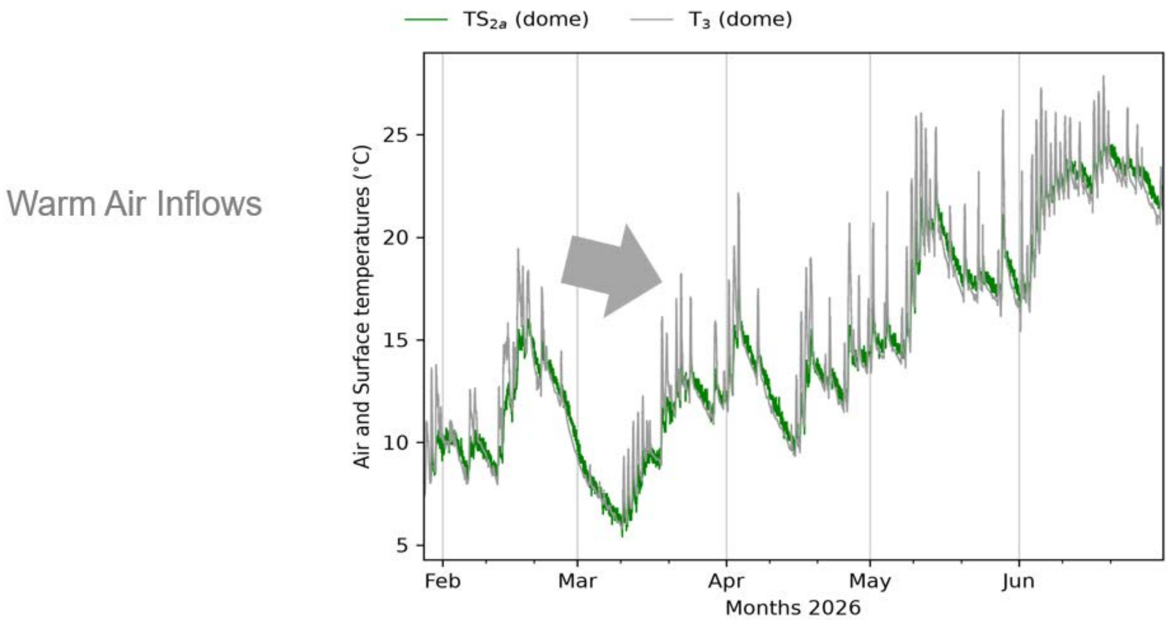


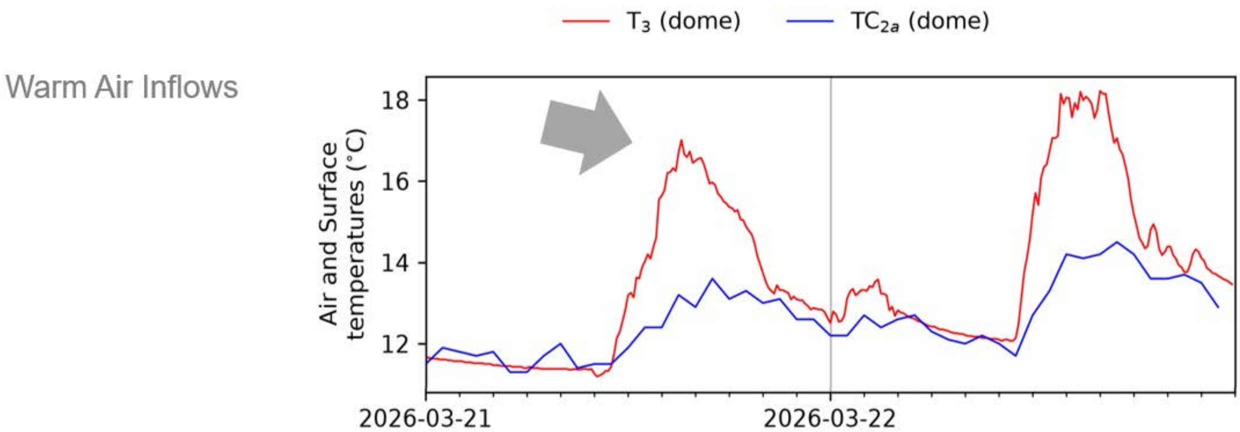


For the high diffusivity of the water vapour molecules and the slow dynamics of the mechanisms inside, the mixing ratio is quite homogeneously distributed over the vertical. No significant layering has been observed.

Surface and air temperatures

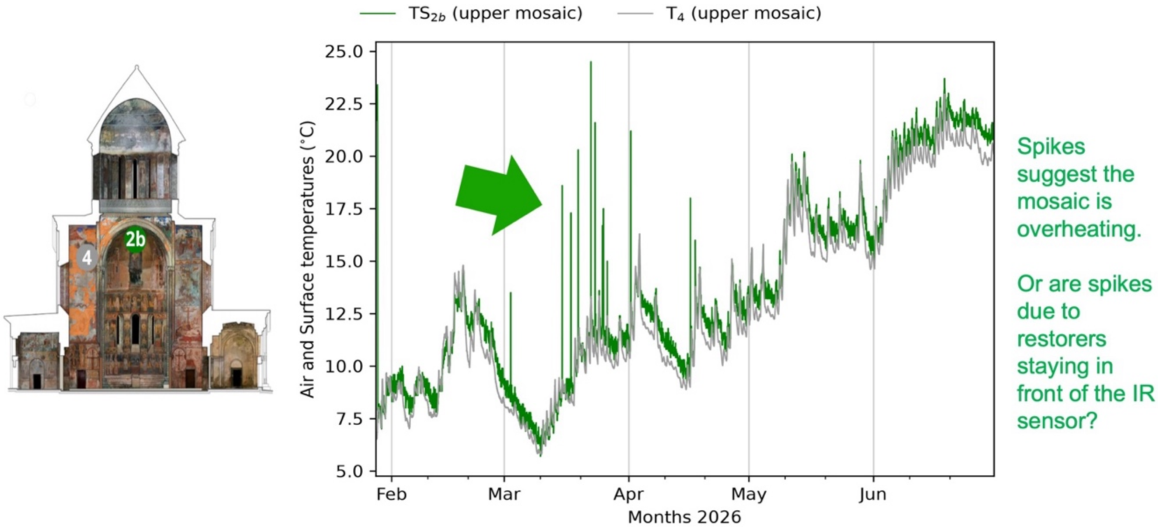
Dome – surface and air temperature

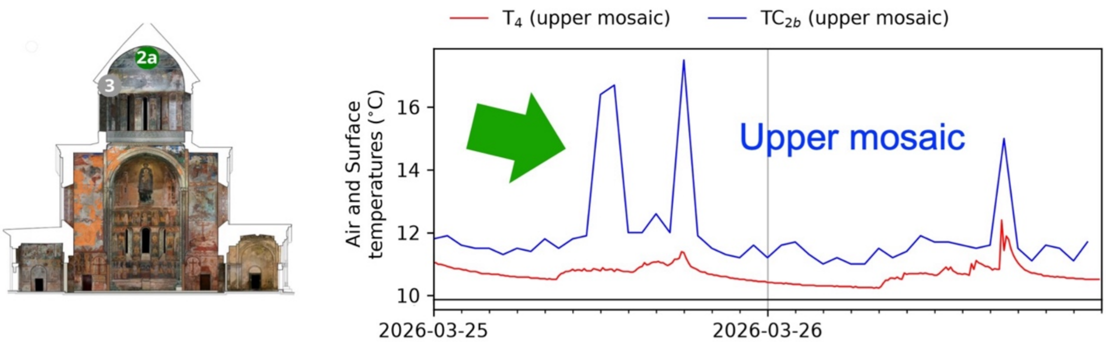


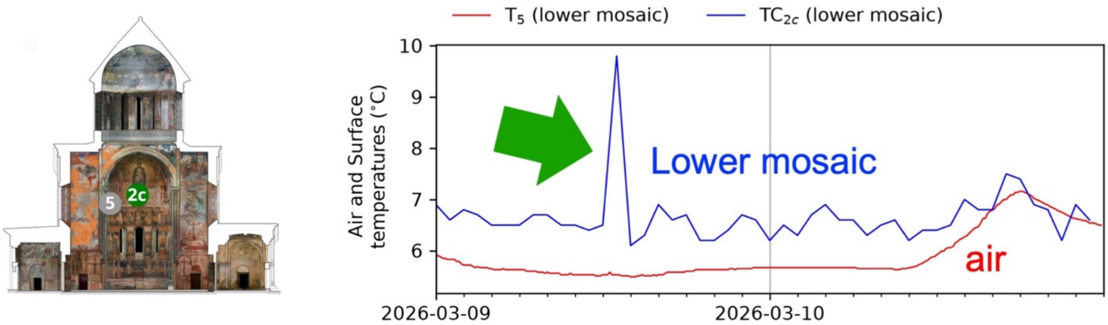


Warm air enters the dome from windows. During the daytime, this air (red curve) is much warmer than the dome temperature. During the night, the air and the dome reach the same temperature.

Mosaic – air and surface temperatures

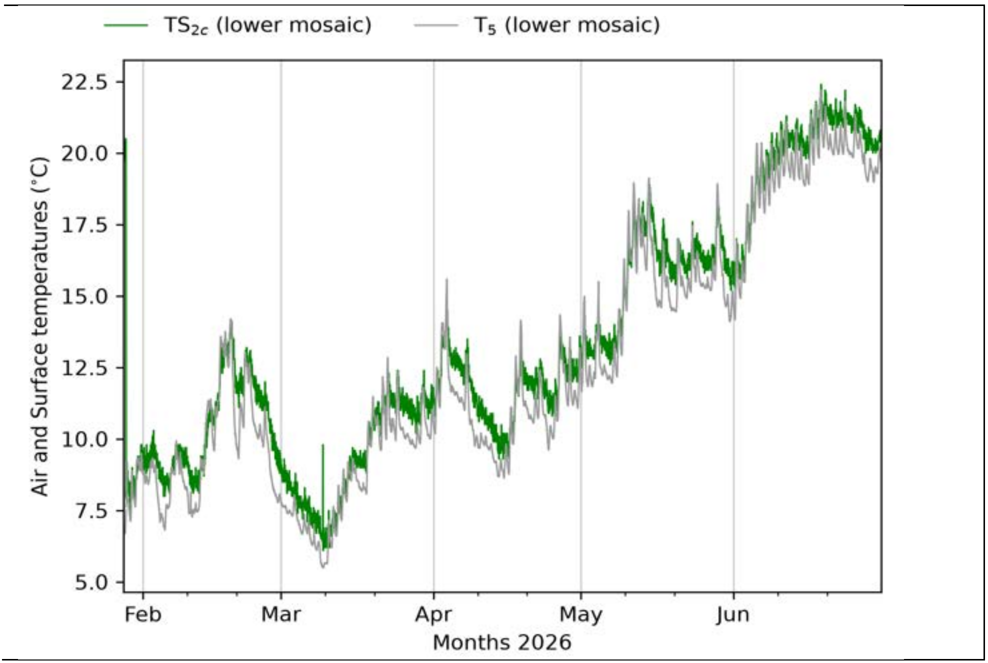






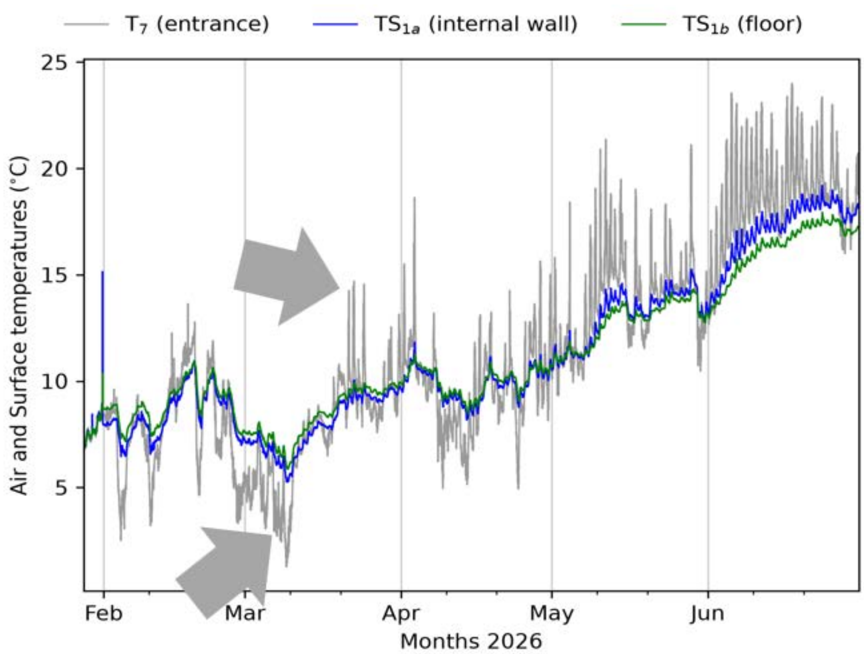
Some peaks of temperature can be found, reaching up to 10°C. The air is unaffected. This means that the heat is radiant heat, e.g. IR radiation. The question is: is this overheating real? Is it due to solar radiation or halogen lamps? Or peaks are due to restorers who passed in front of the IR sensor and the sensor has recorded their input?

Mosaic (lower side) – air and surface temperatures



Entrance room and ground floor air and surface

Cold and Warm Air Inflows



For most of the time, the temperature of the mosaics, or the masonry, is always close to the indoor air temperature, and the almost overlapping, within 1°C. However, some sharp peaks are visible, but they are of different nature.

At the dome, the peaks are frequent and due to warm air (e.g. warm air through windows?).

At the upper mosaic, the peaks reach 10°C and are mostly frequent in the second part of March. However, the overheating is due to the mosaic (not to air as in the dome), and this may be explained with something happened inside, like activity of restorers? people passing in front and being monitored by the IR sensor? use of halogen lamps? energetic radiation reaching the surface? It is recommended to local personnel to control what is happening and avoiding interference with instruments.

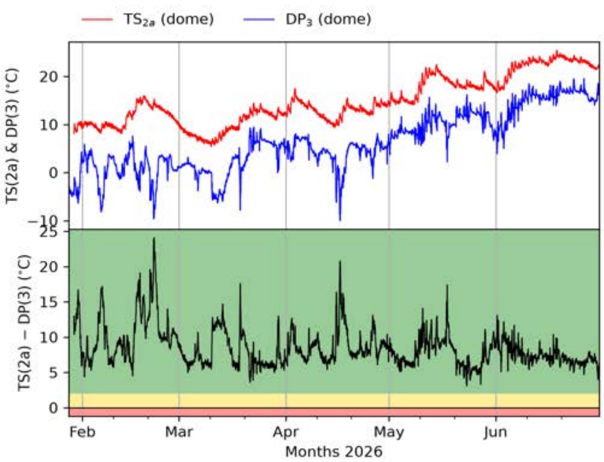
At the lower mosaic the situation is fair, with only one evidence of interference

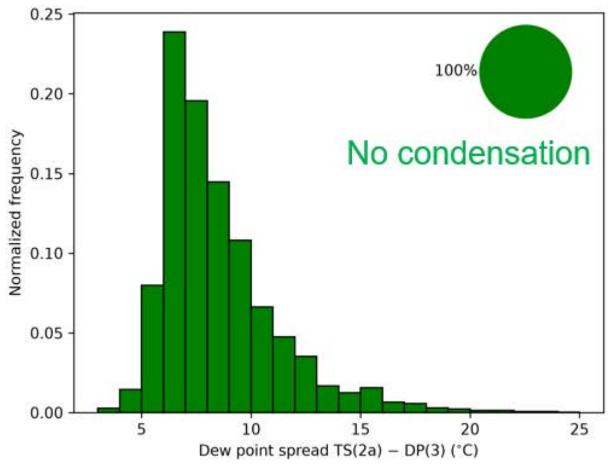
At the entrance room masonry and the floor, the temperature changes like the upper parts commented above, but there are remarkable departures up to 5°C, either positive or negative, likely due to consistent infiltrations of external air entering through the door, warmer by day and cooler by night.

The comparison between air and surface temperatures therefore distinguishes genuine thermal responses of the building fabric from disturbances. Slowly varying, closely coupled curves represent normal heat exchange, whereas abrupt and short-lived divergences are consistent with local air inflows, radiation sources, nearby activity or temporary instrumental interference.

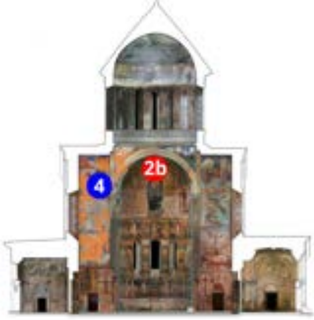
Dew point and condensation

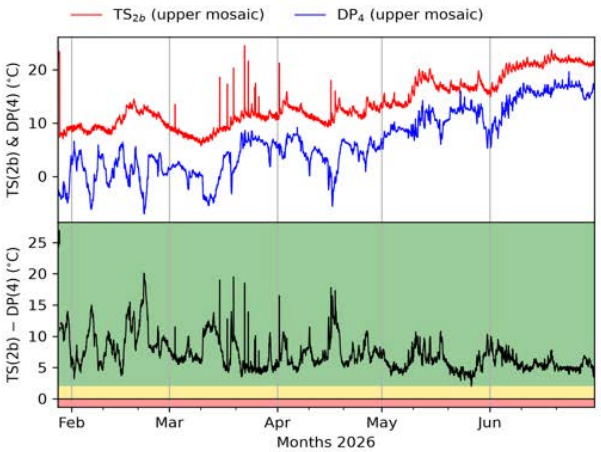
Dome – condensation

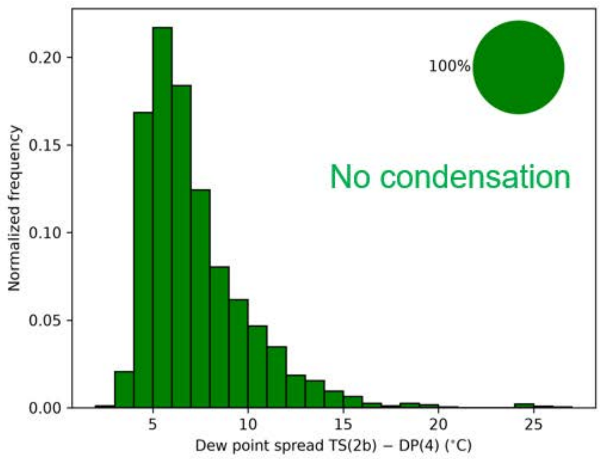




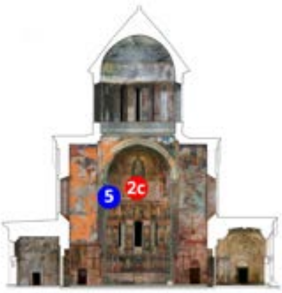
Mosaic (upper side) – condensation

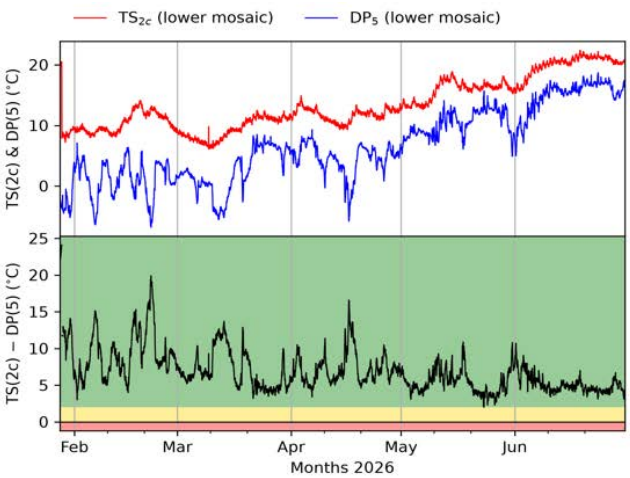


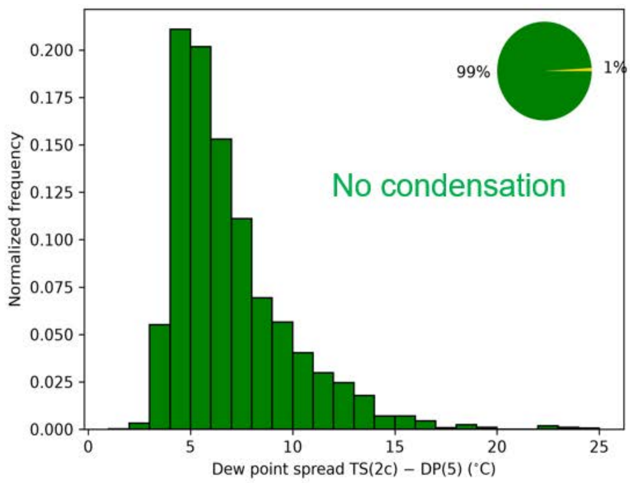




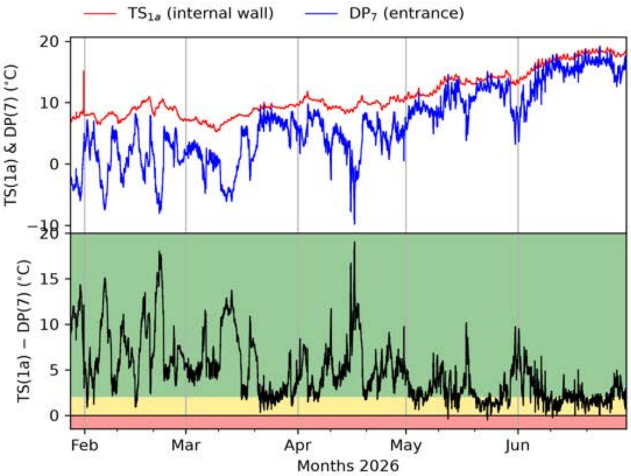
Mosaic (lower side) – condensation

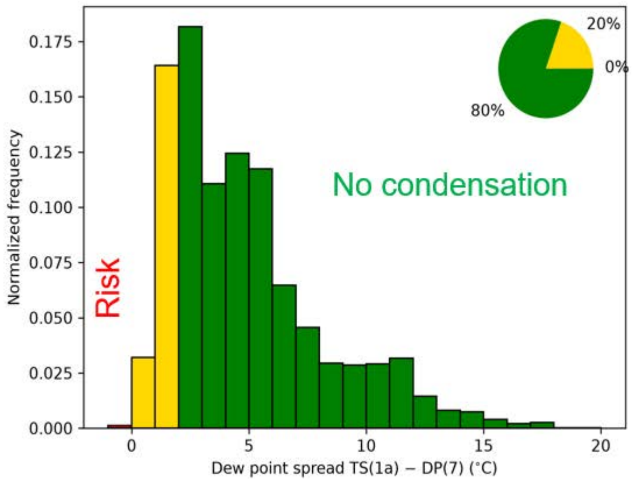




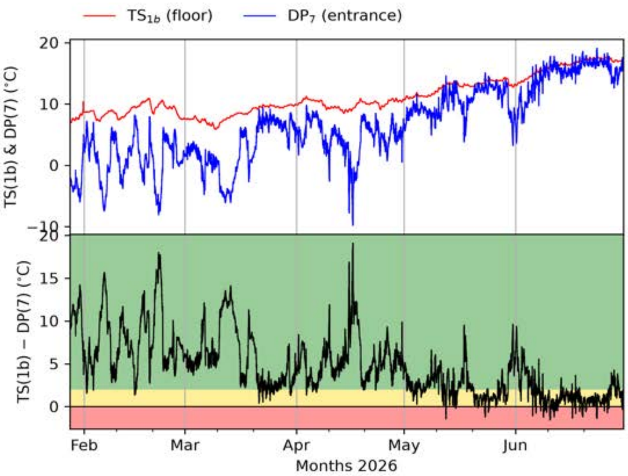


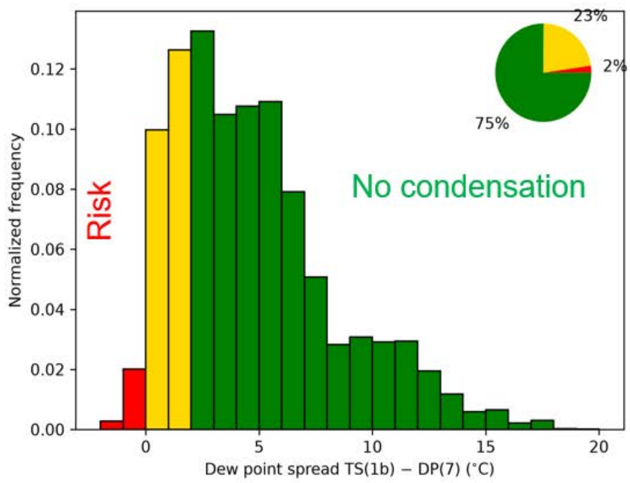
Entrance room condensation





Floor condensation





It should be membered that condensation only occurs when the surface temperature (TS) drops below the dew point (DP) of the air. The difference TS – DP is named Dew Point Spread (DPS). When the DPS is positive, condensation is impossible. When the DPS is negative, condensation occurs. When TS = DP, or is close to it, or there is equilibrium (e.g. evaporation equals condensation), or the value is poorly significant being close to the instrumental uncertainties.

The temperature of the dome, the upper mosaic and the lower mosaic is always (100%) above the dew point of the air, which excludes the condensation.

At ground level, for the frequent and massive inflows of external air, the wall temperature at the entrance room, and the floor temperature reach the risk of condensation for 20-25% of the time.

It must be specified that the commented temperatures approach the dew point, but they have never significantly dropped below the dew point. In other words, the floor and the lower masonry is potentially exposed to surface condensation. These events have been especially observed in June and will likely continue for a month or so.

5. Conclusions about the First half of 2026 monitoring

In the first semester of 2026, like in the previous years, i.e. 2024 and 2025, neither the mosaic, nor the masonry, have suffered condensation because the wall surface temperature has always been above the dew point of the air. Only the floor was affected by some condensation from the late spring.

In comparison with the previous years, the Nativity has reached a better equilibrium.

The evaporation (as excess of indoor MR in comparison with the external value) is not largely dominant as it was before (93-94% of the time), but has significantly decreased to 59% at the dome, 67-68% at the mosaic, 41% in the lower church, while it remains at 74% in the Entrance room. The equilibrium will be reached when the positive departures (evaporation) will equal the negative ones (sorption of moisture), i.e. 50-50%. In addition, in the past years the indoor-outdoor difference reached 4-5 g/kg in the summer, while now it is just in the order of 1 g/kg.

This finding suggests that the external input of water that has so far soaked the roof and walls has been significantly reduced or even stopped. This fundamental issue will be clarified with the next measurements.

For the thermal inertia of the building, and especially the floor, in general the spring and early summer may allow condensation on the colder surfaces. The risk for condensation is especially on the floor, and it has been observed for 20-25% of the time in May and especially in June. This floor dampness may favour microbiological colonization and infestation.

It may be useful to specify that, on the floor stone, once condensation has collected some liquid water, this will likely remain (and is visible) for a relatively long time, as evaporation is difficult for the high humidity level inside. It should be kept in mind that the condensation time is not necessarily coincident with the time in which floor dampness is visible.

The entrance room and the floor near the entrance room are the parts most exposed to the external influence and the penetration of external air. In the growing season from March to June the floor for its inertia remains colder than the external air, that in this season is reach of moisture. This may generate condensation on the floor. The situation in 2026 is likely worse than the general situation, because the building missed part of the solar heating in 2025 for the external shield, and this year it is a bit colder than normal. <u>This early-summer floor condensation is neither exceptional nor anomalous; it is the normal reaction of this building to the climate of Gelati</u>. It may be useful to remind that the same was noted from May to in the North-West Chapel, as outlined in the 2025 report.

The early photographs of this church witness that the lower part of the walls was severely damaged by dampness, and this suggests that the today situation is not much different from that during the centuries crossed by this building.

It is not advisable to make random and uncontrolled actions with fans, heaters, dehumidifiers, or other devices that may severely damage the situation.

However, it may be possible to make structural interventions to change the above characteristics of floor condensation during the late spring-early summer, that is typical of massive buildings and largely documented in the scientific literature.

Change of the building response over time

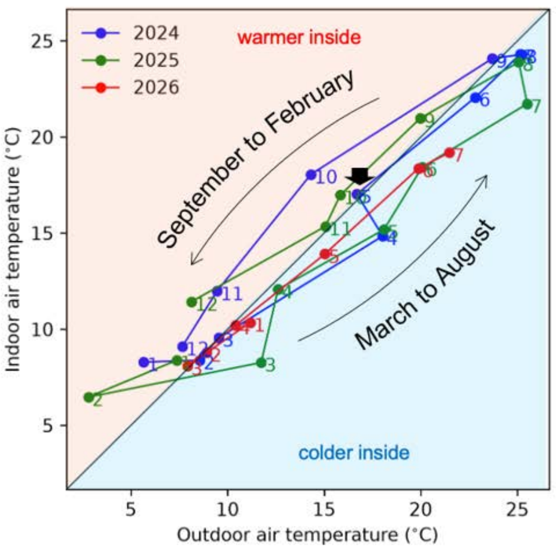
The next two slides explain the transformation of the interactions between the air and the fabric inside the Nativity. Three years are considered with relevant turning points: 2024: the starting year, with water leakage from the roof and evaporation inside; 2025: the year with intensive works and installation of external shield; stopped the leak in the roof; 2026: the year in which the building has returned to normal; no more leakage; however, a side effect: floor condensation in summer. Comments must be limited to the indoor and outdoor air temperatures and mixing ratios, because in the early monitoring system the wall and floor temperatures were not adequately considered.

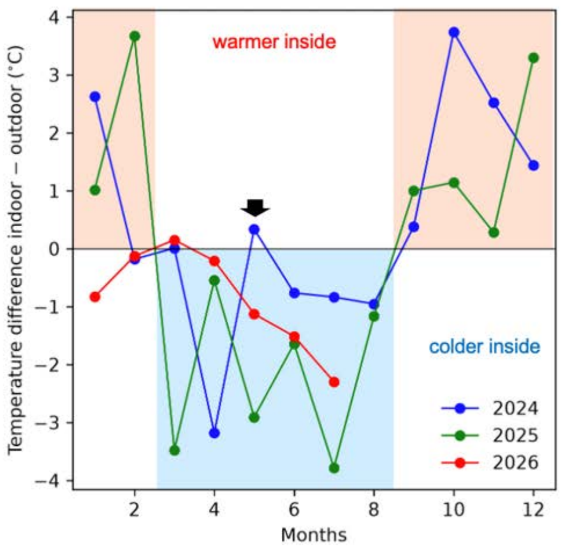
Time evolution of indoor – outdoor air temperatures

The two diagrams show the same variables but presented in a slightly different way: the relationships between internal and external air temperature (monthly averages).

First plot: the indoor versus the outdoor air temperature. The bisector is for indoor air temperature equal to outdoor air temperature, i.e., neither gain nor loss of heat from walls. The monthly averages follow a counterclockwise ellipse, with lowest extreme in January-February, and maximum in August. The width of the minor axis is representative of the thermal inertia of the fabric. In 2024, the width was largest, with walls normally exposed to the atmospheric factors. In 2025 it was severely reduced for the installation of the external shield. In May 2024 (black arrow) there was a short-circuit between outside and inside, probably for some activities that kept doors or windows open. In 2026 the red curve started close to the bisector for the less solar energy absorbed during the 2025 (the external shield). Now it is slightly returning to normality. However, it shows around one-month delay in comparison with the 2024 previous reference.

Second plot: the difference between indoor and outdoor air temperature versus the calendar year. There is marked evidence that the air inside the Nativity is colder from March to August, and the opposite in the rest of the year. The heat gained during the warm season is fundamental to regulate the wall temperature: warm walls lower the risk of condensation; cold walls make more likely condensation. Looking the graph, in general, in the 2024 summer, the inside and the outside temperature had a small difference, while in the 2025 summer the internal cooling increased by 2-3°C. The smaller gain of heat on the fabric will likely have an impact on 2026. However, the memory of the reduced energy balance will disappear over time. The year 2026 started colder, and is progressing midway between the 2024 past reference and the 2025 shielded year.





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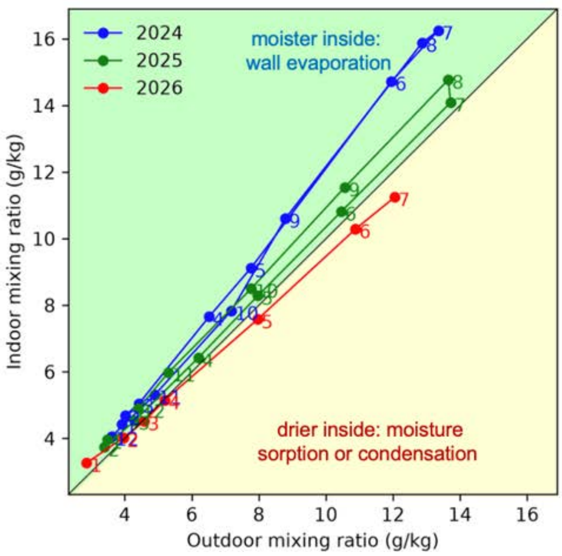
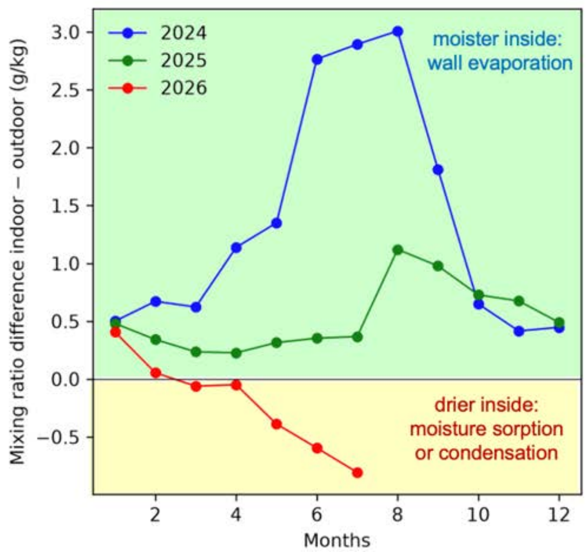
Internal evaporation, moisture absorption, condensation

The two diagrams show the same variables but presented in a slightly different way: the relationships between internal and external mixing ratio (monthly averages).

First plot: the indoor versus the outdoor mixing ratio. The bisector is for indoor mixing ratio equal to outdoor mixing ratio, i.e., neither gain nor loss of moisture between air and walls. Air gains moisture from walls with evaporation; air loses moisture for wall absorption or condensation. The year 2024 is the most departing year from the bisector, showing that air had relevant gain of moisture from walls. This is explained with the diffuse dampness on walls, attributed to leakage from roof. In 2025, the adoption of the external shield had stopped the leakage, and the evaporation was reduced very much, approaching the equilibrium (i.e. evaporation = sorption) given by the bisector. In 2026, the situation was opposed: there was a dominance of moisture subtracted from the air, either for wall absorption and floor condensation, the latter occurring in the warmest months.

Second plot: the difference between indoor and outdoor mixing ratio versus the calendar year. The first year, 2024, characterized by roof leakage, shows an impressive evaporation, especially in the summer months when the air is warm and may load a large number of water molecules. The evaporation drops in October, with the lower temperature and the lower capacity of air to hold water molecules. In 2025, the stop of the leakage and the lower inside temperature reduced the indoor evaporation very much. In 2026, February, March and April started with a well-balanced equilibrium, and then passed to reduce the air moisture content, either for moisture sorption on walls or condensation on the cold floor. The latter has been confirmed by the monitoring system.





Discussion about floor condensation and conservation heating

Floor or wall condensation are typical on massive buildings, and especially in late spring and early summer, for the thermal inertia of the structures and the exponential increase of the moisture content in air. This holds for Gelati too, and the situation has (temporarily) worsened in 2026 for the solar heating missed in 2025. Although summer floor condensation is a natural feature, it has a negative impact, favouring mould growth and infestation. It is reasonable to consider measures to avoid this negative phenomenon. In general, the measures adopted range from biocides to environmental transformations.

There is no need to reinvent the wheel. Please avoid resorting to dangerous do-it-yourself remedies like heaters, fans, dehumidifiers and so on.

The only way to avoid floor condensation is to gently raise the floor temperature of a few degrees Celsius and just for period in which the floor approaches the dew point. This goal can be reached in three ways:

(i) installing an underfloor heating system;
(ii) placed on the interested area, and for the critical period, modular heating platforms
(iii) supplying IR radiation to the critical parts of the floor, during the critical period.

The above three system have different cost, visual impact, efficiency, pros but also adverse effects. The most dangerous system is with high-temperature IR sources, especially when they are operated by personnel not adequately specialized in environmental physics. In addition, the high temperatures of the IR sources modify the internal situation, destroy the air layering, and the air motions that are generated spread suspended particles (including sporae) on the surfaces, infesting walls and causing black stains.

For Gelati, two options are possible:

(i) The Gelati Rehabilitation Committee considers that in the warm season a temporary floor dampness is normal in this building; and that it is recurrent every year from centuries; and, in addition, that this year it might also be a bit worse for the reduced heat gain caused by the external shield. Under such hypothesis it is possible to take note of reality, accept and leave things as they are and have been for centuries.

(ii) If the Gelati Rehabilitation Committee is concerned about floor dampness and thinks it is a priority, or that the natural indoor microclimate should be improved, a floor heating can be considered.

The practice of heating a building to lower the RH for conservation purposes is named "*conservation heating*" and is particularly applied in northern Europe, to counteract the summer dampness. The method is well known and extensively discussed in the scientific literature (e.g. Camuffo et al. 2007 "*Church heating and preservation of the cultural heritage: a guide to the pros and cons of various heating systems*" Electa, Mondadori; Camuffo 2019 "*Microclimate for cultural heritage*" Elsevier, Amsterdam).

The European Standard EN 15759-1: 2011 "*Conservation of cultural property—indoor climate—part 1: guidelines for heating churches, chapels and other places of worship*" has a whole section (i.e. Section 7.2.2) devoted to this topic, i.e.

Section 7.2.2 Conservation heating. «Conservation heating uses heat to improve the indoor climate for conservation. The primary aim is to keep RH at a stable and appropriate level throughout the year to minimize damage due to RH variations and to prevent dampness and biodeterioration. Conservation heating may be needed even in the summer to keep RH below thresholds for mould growth. The secondary aim of conservation heating is to keep the inside of the building envelope warm enough to avoid moisture condensation or frost. Conservation heating can only reduce RH, if the indoor climate is too dry other measures will be needed». Then the section of this Standard continues with comments and recommendations about the conservation heating methodology and its control.

6. Relevant European Standards

EN 15757: 2010. Conservation of cultural heritage — Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials.
EN 15758: 2010. Conservation of cultural heritage — Procedures and instruments for measuring temperatures of the air and the surface of objects.
EN 16242: 2012. Conservation of cultural heritage — Procedures and instruments for measuring humidity in the air and moisture exchanges between air and cultural property.
EN 16682: 2017. Conservation of cultural heritage — Methods of measurement of moisture content, or water content, in materials constituting immovable cultural heritage
EN 15759-1: 2011. Conservation of cultural heritage — Indoor climate - Part 1: Guidelines for heating churches, chapels and other places of worship.
EN 15759-2. Conservation of cultural heritage — Indoor climate - Part 2: Ventilation management for the protection of cultural heritage buildings and collections.