

Astronomy in romanic churches

Ederlinda Viñuales Gavín 

Astronomía y Astrofísica, Universidad de Zaragoza
C/ Pedro Cerbuna 12, Ed. Matemáticas
50009-ZARAGOZA-SPAIN

emails: ederlinda.vinuales@gmail.com and naseprogram.treasurer@gmail.com

Abstract. In this poster we present a study of the orientation of the church of San Adrián de Sasabé in Borau, Huesca (Spain) in a practical way. This church is a characteristic Romanesque construction, predominant in the High Middle Ages, mainly in southwestern Europe.

The apse of Romanesque churches are oriented towards the east. But, in some churches, the apse has three windows and these are oriented in the direction of the sunrises on the days of the solstices and equinoxes. **But sunrises and sunsets depend on the latitude of the place.**

The church of San Adrián de Sasabé, the object of our study, has three windows in the apse, which allows us to carry out the necessary calculations to determine its orientation with precision outside the church.

Keywords. Heritage, Education, Orientation and Astronomy.

1. Introduction

At present, in the construction of temples and public buildings their orientation is not taken into account, mainly due to the value of the land and urban planning laws. They are built where and how is convenient. But it was not always like this. All religious buildings for centuries have been oriented. From the pyramids of Egypt and Mexico to the Hindu and Chinese temples, all its builders sought to erect their temples in a specific position and orientation. Astronomical or religious reasons?

Culturally, Romanesque art was the first great purely Christian and European style that unified the different currents that had been used in the High Middle Ages and managed to formulate a specific and coherent language applied to all artistic manifestations. It emerged gradually and almost simultaneously in Spain, France, Italy and Germany but with its own characteristics, although with enough unity to be considered the first international style, within the European scope.

In Spain the Romanesque is introduced through the Camino de Santiago due to the numerous pilgrimages that come from all over Europe. Thus, the north of Spain, see reference [Canellas \(1992\)](#), is crowded with Romanic buildings.

But Romanesque is a style that is not only used for the construction of churches. We can find castles, palaces, cathedrals, bridges, etc. Also painting and sculpture reached great relevance (Fig. 1).

2. San Adrián de Sasabé church

We will start by saying that the orientation of the Romanesque churches is due to a Christian and not astronomical symbolism, although astronomy is so present. See [Hani \(1997\)](#).

In some well-oriented Romanesque churches with three windows in their apse it is observed that approximately, these three windows are located in the direction of sunrise,



Figure 1. Examples of Romanesque art: a castle, a cathedral and a painting.



Figure 2. Front door and apse of San Adrián de Sasabé.

on the horizon, on the first day of each of the seasons: winter, spring and summer (since that the point of the autumn and spring dawns coincide). But not always the location of the windows in the apse meets this astronomical characteristic. In some cases due to the peculiarities of the land on which the church was built and in others with the purpose of celebrating the saint to whom the church was dedicated.

San Adrián de Sasabé has three apses and is well oriented. But, how can we check the angle that the sunrise forms between a solstice and an equinox (or between the two solstices) in a church?

We know that this angle depends on the latitude of the place.

By a theoretical method, using the *AstroMath* following the program of [Abad \(1998\)](#) and knowing the latitude and longitude of the place: Latitude: $42^{\circ}40^m33^s$ N and Longitude: $0^{\circ}35^m26^s$ W and the declination of the Sun δ , of the Sun at the solstices and equinoxes, we calculate the difference in azimuths between the sunrises of the summer and winter solstices days that turns out to be around $65^{\circ}31^m50^s$.

But it is much more interesting and educational to do this calculation in the church itself and with students. Read the article [Viñuales \(2012\)](#).

How can we proceed? Look at the Fig. 2 (right).

Working outside of the church, we project the sill of the central window on the floor and that of one of the side windows. Next, we draw the perpendicular through the midpoint in the projection of the windowsills. The angle formed by the two red lines in the image of San Adrián de Sasabé will give us the angular displacement of the sunrise from a solstice to the equinoxes. So, the angle obtained by measuring it *in situ* was about 65° , approximately that obtained theoretically.

As a consequence all of the above, *we can conclude that the three windows of the apse of San Adrián de Sasabé was oriented astronomically with all intention, so that the first rays of the Sun entered through the three windows of the apse the solstices and equinoxes days.*

References

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