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New knowledge in determining the astronomical orientation of Incas object in Ollantaytambo, Peru

K. Hanzalová[1], J. Kloko**č**ník[2], and J. Kostelecký[3]

[1]Czech Technical University in Prague, Faculty of Civil Engineering, Department of Mapping and Cartography, Prague 6, Czech Republic

[2]Astronomical Institute of the Academy of Sciences of the Czech Republic, Ondřejov Observatory, Czech Republic

[3]CEDR, Research Institute for Geodesy, Topography and Cartography, Zdiby 98, Czech Republic

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Abstract. This paper deals about astronomical orientation of Incas objects in Ollantaytambo, which is located about 35 km southeast from Machu Picchu, about 40 km northwest from Cusco, and lies in the Urubamba valley. Everybody writing about Ollantaytambo, shoud read Protzen (1993). He devoted his monograph to description and interpretation of that locality. Book of Salazar and Salazar (2005) deals, among others, with the orientation of objects in Ollantaytambo with respect to the cardinal direction. Zawaski and Malville (2007) documented astronomical context of major monuments of nine sites in Peru, including Ollantaytambo. We tested astronomical orientation in these places and confirm or disprove hypothesis about purpose of Incas objects. For assessment orientation of objects we used our measurements and also satellite images on Google Earth and digital elevation model from ASTER. The satellite images used to approximate estimation of astronomical orientation. The digital elevation model is useful in the mountains, where we need the really horizon for a calculation of sunset and sunrise on specific days (solstices), which were for Incas people very important. By Incas is very famous that they worshiped the Sun. According to him they determined when to plant and when to harvest the crop. In this paper we focused on Temple of the Sun, also known the Wall of six monoliths. We tested which astronomical phenomenon is connected with this Temple. First, we tested winter solstice sunrise and the rides of the Pleiades for the epochs 2000, 1500 and 1000 A.D. According with our results the Temple isn't connected neither with winter solstice sunrise nor with the Pleiades. Then we tested also winter solstice sunset. We tried to use the line from an observation point near ruins of the Temple of Sun, to west-north, in direction to sunset. The astronomical azimuth from this point was about 5 ° less then we need. From this results we found, that is possible to find another observation point. By Salazar and Salazar (2005) we found observation point at the corner (east rectangle) of the pyramid by *Pacaritanpu*, down by the riverside. There is a line connecting the east rectangular "platform" at the river, going along the Inca road up to vicinity of the Temple of the Sun and then in the direction to the Inca face. Using a digital elevation

model we found the astronomical azimuth, which is needed for confirm astronomical orientation of the Temple. So, finally we are able to demonstrate a possibility of the solar-solstice orientation in Ollantaytambo.

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