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Improving a 1 meter telescope in order to follow giant planets in a pro-am collaboration. Next step : an affordable adaptive optic system.

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Abstract

Pic du Midi observatory is known for a long time to produce some of the best planetary images. That's the result of a strong collaboration between professionals and amateurs these last 15 years [1]. The technique is still improving, and we even consider the possibility to use an adaptive optic system next year. This affordable system, developed in collaboration with Imagine Optic could also interest other observatories with telescopes in the 0.5 to 2m range. However just with the lucky imagining method, we already have done a lot of publications with the astronomers of Bilbao University [2], [3].

1. Introduction

In order to obtain high resolution images of the solar system in the visible part of the spectrum, a 1 m telescope is a good compromise. You also need a very good site with good seeing conditions and that's what we have at the Pic du Midi observatory, near the border between France and Spain at an altitude of 3000m. Because of that, the 1 m telescope of the Pic du Midi observatory is one of the best in the world in this field. But planetary observing is time consuming and it became more and more obvious that a strong team was necessary to make a good survey. So we are building a team of professional and amateurs to use the telescope as much as possible. The telescope belongs to Observatoire Midi Pyrénées but is used by a team of the "Observatoire de Paris" (IMCCE - LESIA) only for planetary topics.

2. Improvements

The first big step was the use of fast cameras. They became better, faster and cheaper! But with a 17m nominal focal length, the cameras usually used by amateurs are most of the time too small for a planet like Jupiter. It's only since few years that we have cameras with a sensor both fast and large enough for a telescope that big. With the improvement of the image quality, it became more and more obvious that a refraction corrector was necessary. So we add one. Now the images are so good that we discovered some minor optical defaults which are limiting the image quality for some position of the telescope. We started to think to characterize the defaults and correct them with an affordable system of adaptive optics. It's based on a simple deformable mirror with 40 actuators, and a wave front sensor. The goal is to have a final product available in 2018. If it works, this new product can be put on the market, and may be interesting for other telescopes between 0.5 and 2m.

3. Figures

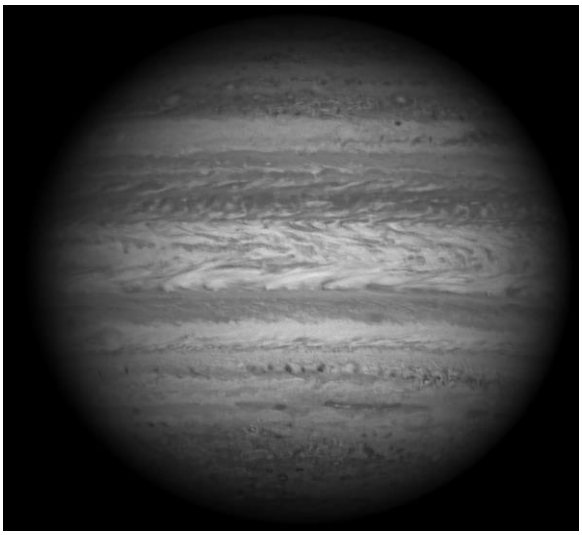

Figure 1: Jupiter seen with the 1 m telescope of the Pic du Midi observatory 2014/10/14.

Figure 1: This global map of Jupiter has been obtained with the 1 meter telescope of the Pic du Midi observatory.

4. Summary and Conclusions

We already have very good result with the 1 meter telescope. Our goal is to have more and more people in the team in order to make a survey has long as possible of Jupiter, Uranus and Neptune. The next step is an OA system, we want to make it work on the 1 meter telescope and also make it available on the market to help other observatories to produce high resolution images of the solar system with middle size telescopes.

References

[1] The "Station de Planétologie des Pyrénées" (S2P), a collaborative science program in the course of a long history at Pic du Midi observatory, EPSC 2015

[2] Jupiter's zonal winds and their variability studied with small-size telescopes. Astronomy & Astrophysics, Volume 554, id.A74, 11 pp

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