

Sigismondi Costantino

Position in ICRANet: PhD Student

Period covered: 2008



I Scientific Work

Solar Variability: Ground Based Measurements of the Solar Diameter.

The recent history of solar diameter is being recovered through central eclipses data. Method and data analysis procedure has been implemented for 2006 total eclipse (papers submitted to Solar Physics and to Science in China).

The largest negative oscillation ever published ($-0.41''$) of solar diameter has been found for 2006 march 29 total eclipse, as well as the evidence of short timescales of such oscillations (half year for $0.5''$ oscillation).

Publications:

1. C. Sigismondi, *Long Waves Perturbations to Astronomical Tides in Adriatic and Tyrrhenian Sea*, Proc. IV Sino-Italian Workshop, Pescara, July 22-29, 2007 AIP Conference Proceedings **966**, 333-340, 2008.
2. C. Sigismondi, *Solar Radius Variations Measured in Central Eclipses*, Proc. IV Sino-Italian Workshop, Pescara, July 22-29, 2007 AIP Conference Proceedings **966**, 341-348, 2008.
3. C. Sigismondi, *Effemeridi - Introduzione al Calcolo Astronomico*, Ateneo Pontificio Regina Apostolorum Roma (2008). ISBN - 9788889174708
4. C. Sigismondi, *La Sfera da Gerberto al Sacrobosco*, Ateneo Pontificio Regina Apostolorum Roma (2008). ISBN - 9788889174760
5. C. Sigismondi, ed. *CVLMINA ROMVLEA, Fede e Scienza in Gerberto, Papa Filosofo*, Ateneo Pontificio Regina Apostolorum Roma (2008). ISBN - 9788889174753
6. C. Sigismondi, *Measures of Solar Diameter With Eclipses: Data Analysis, Problems and Perspectives*, in *Light from Dark Universe*, Proc. of V Sino-Italian Workshop, May 28-June 1, 2008 (AIP Conf. Proc., in press).
7. C. Sigismondi, J. Arnaud, *European Projects of Solar Diameter Monitoring*, in *Light from Dark Universe*, Proc. of V Sino-Italian Workshop, May 28-June 1, 2008 (AIP Conf. Proc., in press).
8. C. Sigismondi, *Guidelines for Measuring Solar Radius with Baily Beads Analysis*, *Science in China*, submitted
9. C. Sigismondi, A. Kilcik, J-P. Rozelot, K. Guhl, *Solar Radius Determination from Solar Eclipse Observations of March 29, 2006*, *Solar Physics*, submitted.

II Conferences and educational activities

Conferences and Other External Scientific Work

- 1) Light from Dark Universe, Taipei-Hualien, May 28 - June 2, 2008 (Taiwan; talk)
- 2) III Stueckelberg Workshop on Relativistic Field Theories, Pescara July 8-18, 2008 (talk)
- 3) Solar Magnetism, Corona and Space Weather-Chinese Space Solar Telescope Science, 28 Luglio-1 Agosto, 2008, Jiuquan, Gansu (China; contributed poster)
- 4) XXVII European Symposium on Occultation Programs, Drebach August 29-September 2, 2008 (Germany; invited talk)
- 5) XXVII SIC, Scientific Instruments Commission, Lisboa September 16-21, 2008 (Portugal; talk + poster)
- 6) Cycle des Grandes Conférences: L'origine de l'Univers entre cosmologie et astrophysique, Nice, October 15, 2008 (invited)
- 7) Mensura Caeli, National Congress of Archeoastronomy Italian Society, Ferrara, October 17-18, 2008 (talk)
- 8) XVI GAD congress on Digital Astronomy and First National Meeting on Extrasolar Planets, Ravenna October 18, 2008 (talk)

Visit to IRSOL, Istituto Ricerche Solari Locarno (CH) from April 29 to May 7 and from July 30 to August 15, 2008 for research on solar diameter measurements with hourly circle transits.

Work With Students

Laboratory of Astrophysics, team of Prof. Paolo de Bernardis (Sapienza University)

Micol Benetti, Alessandra Mastrobuono Battisti, Paolo Fermani, Marco Innocenti, Irene di Palma, Luca Naticchioni.

Diploma thesis supervision

Sapienza University: Licia Mangione, Il Sistema Tolemaico e quello Copernicano al Vaglio delle Grandi Meridiane. Diploma in Geography (February 2008).

Other Teaching Duties

Courses at "Sapienza" University of Rome Geography Department

"La Terra nel Sistema Solare" (4 credits).

"Geodesy (GPS)" (2 credits)

"Oceanography" (2 credits)

All courses with about 20 undergraduate students.

III 2007-2008 List of Publications

C. Sigismondi, *Relativistic Corrections to Lunar Occultations*, Proc. of Tenth Italian-Korean Meeting on Relativistic Astrophysics, Pescara, June 25-30, 2007 (Journal of Korean Physics in press).

C. Sigismondi, *La Terra come osservatorio astronomico: le misure del diametro solare in eclissi e durante i transiti di Venere e di Mercurio*, Geografia (2007).

C. Sigismondi, *Gerberto e la Misura delle Canne d'Organo*, Archivum Bobiense 29 355-398 (2007).

C. Sigismondi, *Long Waves Perturbations to Astronomical Tides in Adriatic and Tyrrhenian Sea*, Proc. IV Sino-Italian Workshop, Pescara, July 22-29, AIP Conference Proceedings 966, 333-340, 2008.

C. Sigismondi, *Solar Radius Variations Measured in Central Eclipses*, Proc. IV Sino-Italian Workshop, Pescara, July 22-29, AIP Conference Proceedings 966, 341-348, 2008.

C. Sigismondi, *Effemeridi - Introduzione al Calcolo Astronomico*, Ateneo Pontificio Regina Apostolorum Roma (2008). ISBN – 9788889174708

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C. Sigismondi, *Guidelines for Measuring Solar Radius with Baily Beads Analysis*, Science in China, submitted

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Graduated in Astrophysics in 1994 and in Theology in 1998, earned his PhD in Theoretical Physics in 1998. Visiting Scholar at Yale Astronomy department from 2000 to 2002 and 2006 on Solar Physics, he is now professor of Physics and Laboratory in Alessandro Volta Institute in Rome and Faculty member in the department of Geography at Sapienza University since 2002/2003 and in the Pontifical University Regina Apostolorum since 2005/2006. Since 2003 he organizes yearly international meetings on Gerbert of Aurillac on May 12th. Research topics on Solar Astrometry (now also with PICARD team) and Solar Secular Variability; Pinhole Astronomy and Historical Meridian Lines; Gerbert of Aurillac and X century science.

Science

The method of measuring the solar diameter through eclipses has been deeply investigated in the last 8 years. The main contributions in developing this field of research have been

- 1) the studies of the effect of different filters on the measurements of the disappearing and appearing times of Baily beads;
- 2) the definition of the method of computing the ΔR correction to the standard radius with a spreadsheet;
- 3) the publication of a Baily Beads atlas, through which the analysis made with different ephemerides and/or different observers can be compared;
- 4) the comparison between eclipse and astrolabe observations in the same period of time,
- 5) the revival of hourly circle transits with high temporal frequency imaging (60 fps) to overcome seeing effects.

All publications listed in 2008 are related with these topics.

In History of Astronomy he is studying the onset of Copernican Revolution during XVII and XVIII centuries, focusing on the methods of alignment of the great meridian lines in the Churches.

He has completed the astrometric recognition of the following meridian lines

- 1) S. Maria degli Angeli, Roma (Bianchini) 1702 +4' 29"
- 2) S. Petronio, Bologna (Cassini) 1655 +2' 09"
- 3) S. Maria del Fiore, Firenze (Toscanelli) 1475 -19' 54"
- 4) S. Maria del Fiore, Firenze (Ximenes) 1761 -0' 27"
- 5) Duomo, Milano (De Cesaris) 1786 +0' 06"
- 6) Piazza S. Pietro, Roma (Gigli) 1817 -5' 36"

The azimuth of those lines is not exactly Northward, this difference is about 300 times the uncertainty on the latitude, which was measured up to a few arcseconds of accuracy.

The errors on azimuth, already present in the meridian of Tycho at Uraniborg (-17'), are too large to be attributed to building errors, they are reliably related to the methods of solution of Kepler's equation in the computation of the ephemerides.

These results have been presented in Lisbon at the Scientific Instrument Commission meeting of 2008.

The method used for measuring the alignment of the meridian lines has been applied to the orientation of μ telescopes in the project EEE, Extreme Energy Events – Science in the School promoted by the Centro Fermi and Italian Ministry of Education.

On Gerbert of Aurillac, besides the organization of yearly international congresses on May 12 since 2003, he has studied his treatise on Organ Pipes, showing the algorithm used for computing the second lower octave and interpreting it in a Pythagorean-Boethian framework.