

The Mock LISA Data Challenges

Shane L. Larson

Center for Gravitational Wave Physics, Penn State
(for the *Mock LISA Data Challenge Task Force*, WG1b)

LISA Science Analysis Workshop, 2006

Who we are...

- Task force in LIST Working Group 1b (WG1b).
- 12 members in US and Europe
Keith Arnaud (GSFC), Stas Babak (AEI), John Baker (GSFC), Matt Benacquista (will work for food), Joan Centrella (GSFC), Neil Cornish (MSU-Bzn), Curt Cutler (JPL), **Shane Larson (CGWP)**, B. Sathyaprakash (Cardiff), **Michele Vallisneri (JPL)**, Alberto Vecchio (Birmingham), Jean-Yves Vinet (Nice)
- Charged with “*organizing mock data challenges for the LISA data analysis development efforts... to validate proposed algorithms and ensure that they can indeed meet the requirements of the LISA data analysis system.*”

LISA Signal Simulation

- The *LISA Simulator* and *Synthetic LISA*
- Have been reworked for the MLDC (TLS v2.1.1, SL v1.3.1) to read and write common data formats (lisaXML) and generate outputs that agree
- *pseudoLISA* specification, descriptors of spectral properties and statistics of the noise models and TDI combinations used by TLS and SL
- LISACode was announced during the *LISA Symposium* by a collaboration including the APC (Paris VII Univ.) and ARTEMIS (Observatoire de la Cote d'Azur, Nice).
 - Brand new, welcome input from LISA user community
 - Very exciting – modularity appears to be of great use (noise models, ephemeris models, response modules, etc.)
 - Working closely with M. Vallisneri (lisaXML?)

LISA Signal Simulation

- The *LISA Simulator* and *Synthetic LISA*
- Have been reworked for the MLDC (TLS v2.1.1, SL v1.3.1) to read and write common data formats (lisaXML) and generate outputs that agree
- *pseudoLISA* specification, descriptors of spectral properties and statistics of the noise models and TDI combinations used by TLS and SL
- LISACode was announced during the *LISA Symposium* by a collaboration including the APC (Paris VII Univ.) and ARTEMIS (Observatoire de la Cote d'Azur, Nice).
 - Brand new, welcome input from LISA user community
 - Very exciting – modularity appears to be of great use (noise models, ephemeris models, response modules, etc.)
 - Working closely with M. Vallisneri (lisaXML?)

lisaXML

- Specification for managing metadata from LISA simulations
- Based on XSIL, and carries as part of the specification useful descriptors (e.g. units – avoids having conventions for units; the specification is carried in the metadata).
- lisaXML contents:
 - Simulation metadata (author, code, offsets, cadences, etc)
 - LISA geometry specification (ephemeris starting point)
 - LISA noise prescription, TDI variables
 - Pointer to external stream (signal file – can point to SLDP)
 - Source parameterization
- i/o routines available in C, Python, & MATLAB (“soon”)
- Echo with web browsers

lisaXML

- Specification for managing metadata from LISA simulations
- Based on XSIL, and carries as part of the specification useful descriptors (e.g. units – avoids having conventions for units; the specification is carried in the metadata).
- lisaXML contents:
 - Simulation metadata (author, code, offsets, cadences, etc)
 - LISA geometry specification (ephemeris starting point)
 - LISA noise prescription, TDI variables
 - Pointer to external stream (signal file – can point to SLDP)
 - Source parameterization
- i/o routines available in C, Python, & MATLAB (“soon”)
- Echo with web browsers

Data Pipelines

- Complete description, by source type, for producing simulated LISA data.
- Current pipelines: *galactic binaries*, *SMBH binaries*, and *EMRIs*.
- **Most importantly**: provide the codes which produce $\{h_+, h_\times\}$ at the barycenter. Theory descriptions for these waveforms in the MLDC Omnibus document.

Mock Data Challenges

- Devised a set of Mock Data Challenges of increasing complexity
- For each Challenge, MLDC provides data pipelines, and two data sets: [training data](#) and [blind data](#).
- Timeline to help coordinate activities with regards to the Mock Data Challenges. Staged in ~ 6 month intervals, with intermediate gatherings to help troubleshoot problems and gather information about progress so that upcoming challenges can be adapted to encourage our current analysis capabilities.

Connections

- Mock Challenge Data will be available **30 June 2006** through Astrogravs:
`http://astrogravs.nasa.gov/docs/mldc/`
- All documentation and codes are version controlled through Sourceforge. All versions publicly available through SVN there:
`http://sourceforge.net/projects/lisatools`
- Our workspace is a wiki:
`www.tapir.caltech.edu/dokuwiki/listwglb:home`
- We welcome new members and collaborators!

Connections

- Mock Challenge Data will be available **30 June 2006** through Astrogravs:
`http://astrogravs.nasa.gov/docs/mldc/`
- All documentation and codes are version controlled through Sourceforge. All versions publicly available through SVN there:
`http://sourceforge.net/projects/lisatools`
- Our workspace is a wiki:
`www.tapir.caltech.edu/dokuwiki/listwglb:home`
- We welcome new members and collaborators!