基于“大数据”的空间环境态势感知

Prof. Mark D. Butala

教育和工作经历

时间	学位 / 职务	院校 / 单位
2004 - 2010	博士 （电子与计算机工程专业）	美国伊利诺伊大学厄巴纳香槟校区
2010.10 - 2015.12	研究员	美国宇航局喷气推进实验室/加州理工学院
2016.01 - 2017.09	研究科学家	美国伊利诺伊大学厄巴纳香槟校区
2017.09 - 至今 (我的妻子和孩子和我一起来到了中国)	助理教授，研究员 ，博士生导师	浙江大学伊利诺伊大学厄巴纳香槟校区联合学院

重要奖项

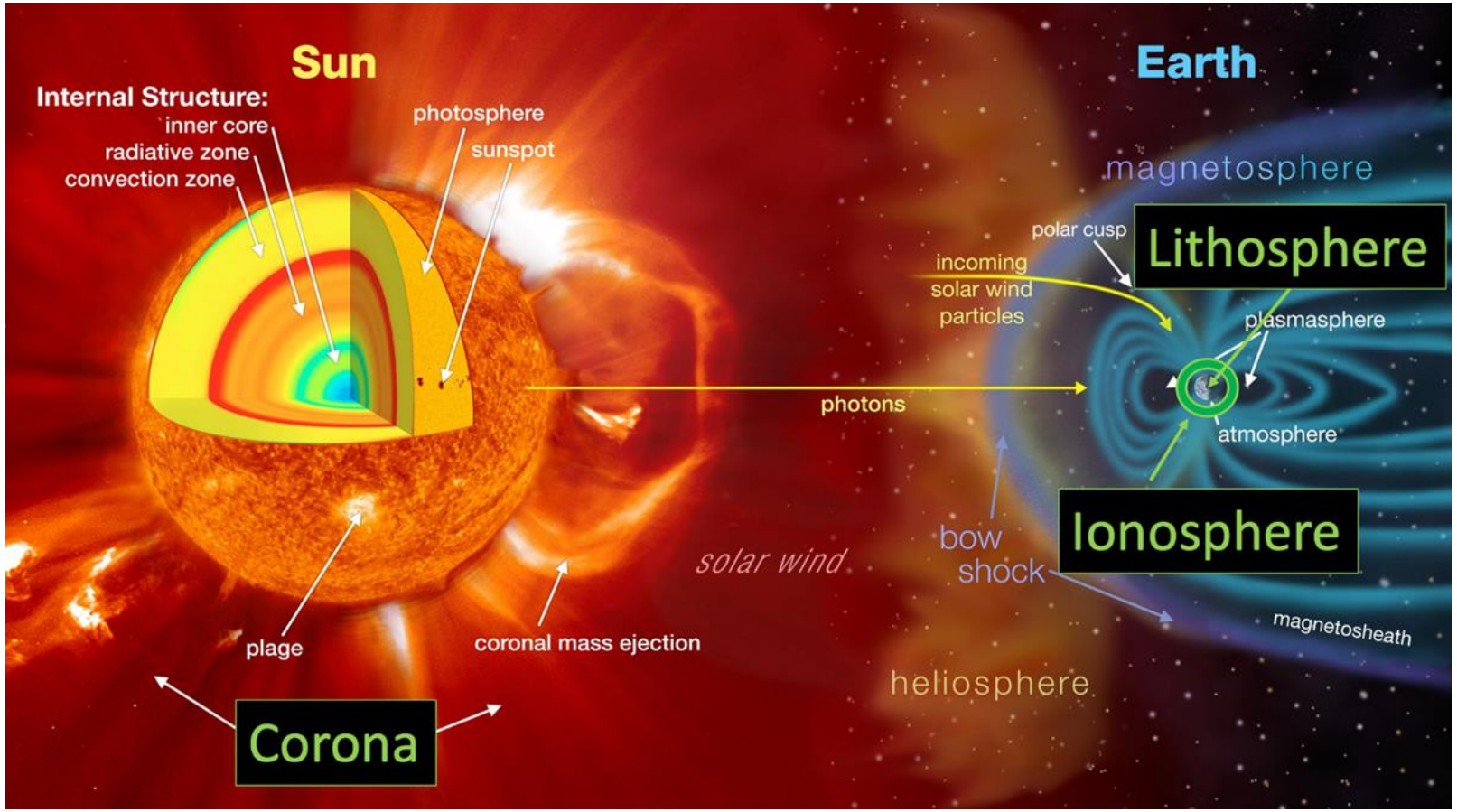
- Graduate studies completely supported by **competitive** awards
  - **National level**: NSF Graduate Research Fellowship
  - **University level**: UIUC ECE and CSE Department Fellowships
  - **Industry**: MIT Lincoln Laboratories Fellowship

- Three NASA group achievement awards
  - Recognized for contribution to successful Mars landing of Curiosity rover (2012)

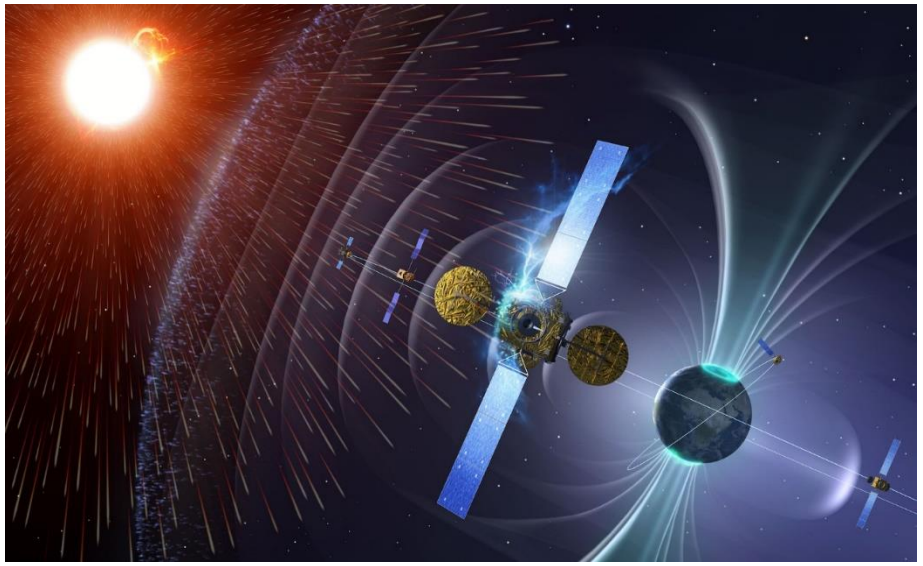
- Served on three NASA research review panels
  - Acted as panel Executive Secretary (2014)

从太阳到地球的研究项目

- My research experience spans the space environment



日冕物质福射对经济造成毁灭性影响



“[The] impact could be big – on the order of $2 trillion during the first year in the United States alone”

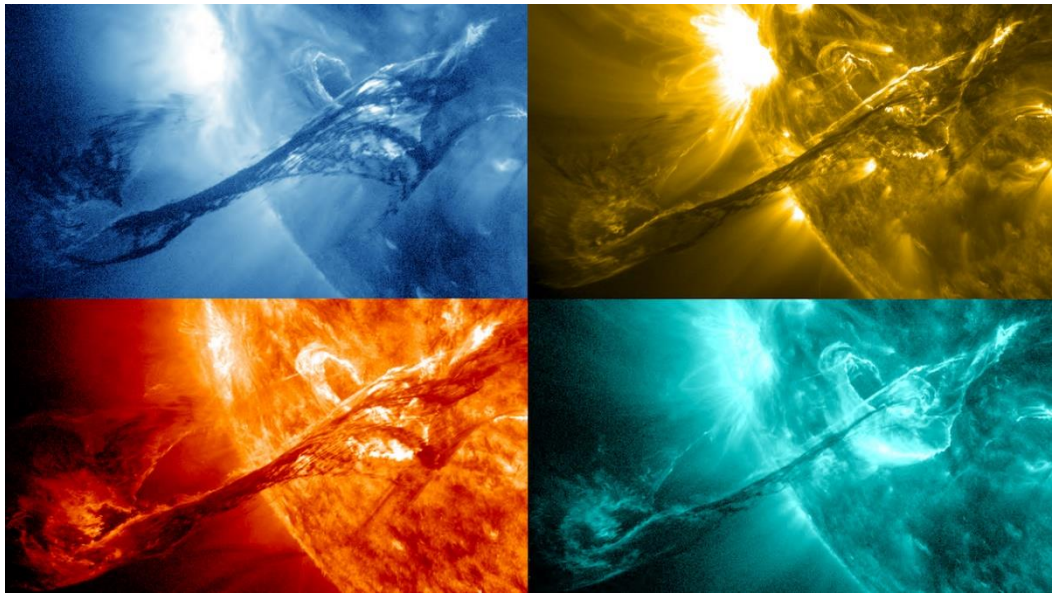
John P. Holdren (former Assistant to the President for Science and Technology)

- Disruption or damage to power transmission systems
- Loss of satellite navigation (BeiDou)

研究方向#1：基于太阳的数据同化

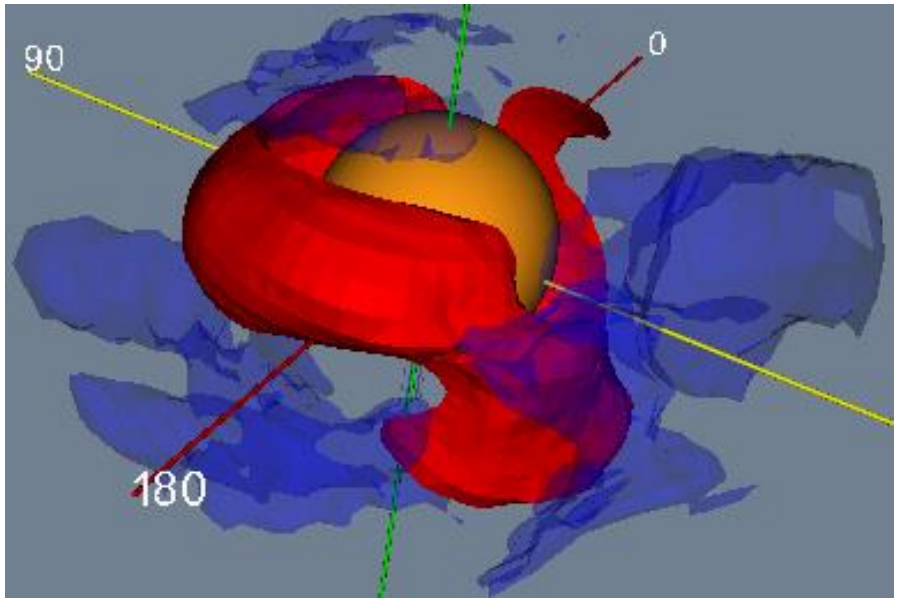
- My research pioneered solar data assimilation

Data: 4096 x 4096 images, 1.5 TB daily



Massive computation

Output: 4-D reconstruction of density and temperature



对太阳的研究的太空科学影响

- My research continues to influence space science research

Journal of Geophysical Research: Space Physics

RESEARCH ARTICLE

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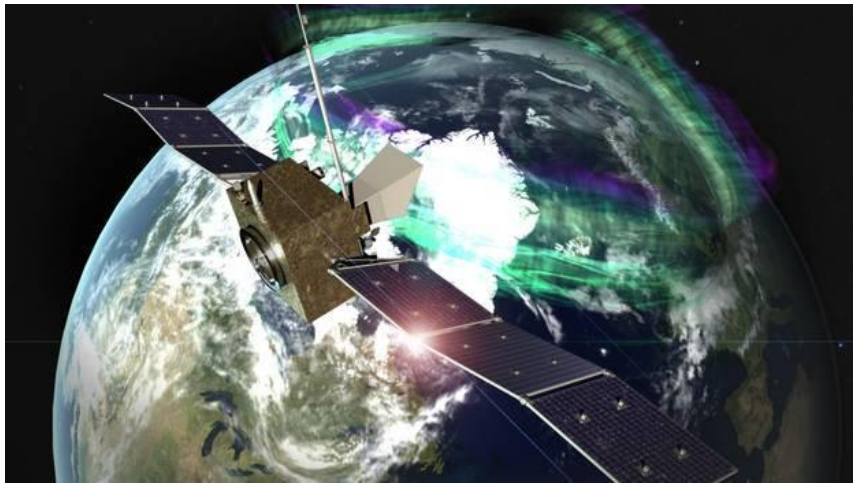
Published online 15 JUN 2018

Tomographic Estimation of Exospheric Hydrogen Density Distributions

G. Cucho-Padin[1] and L. Waldrop[1]

- Poised to utilize data from exciting upcoming missions / instruments



SMILE
Solar wind Magnetosphere Ionosphere Link Explorer

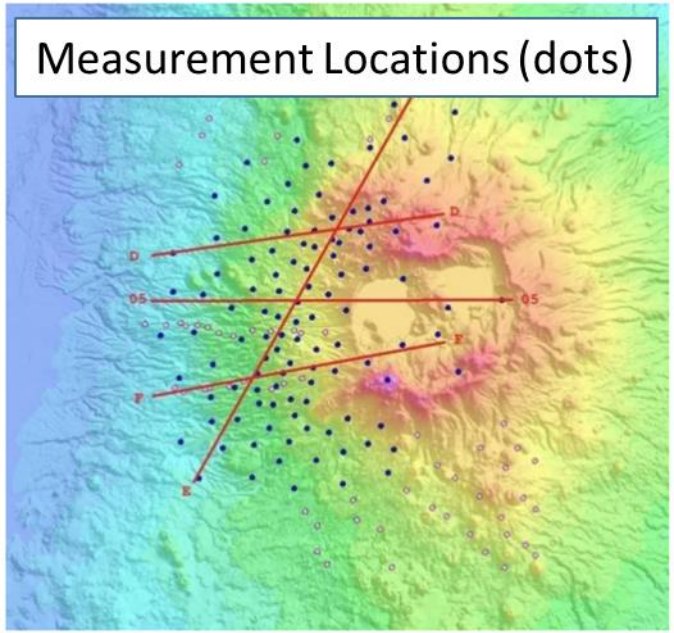
esa

CHINESE ACADEMY OF SCIENCES

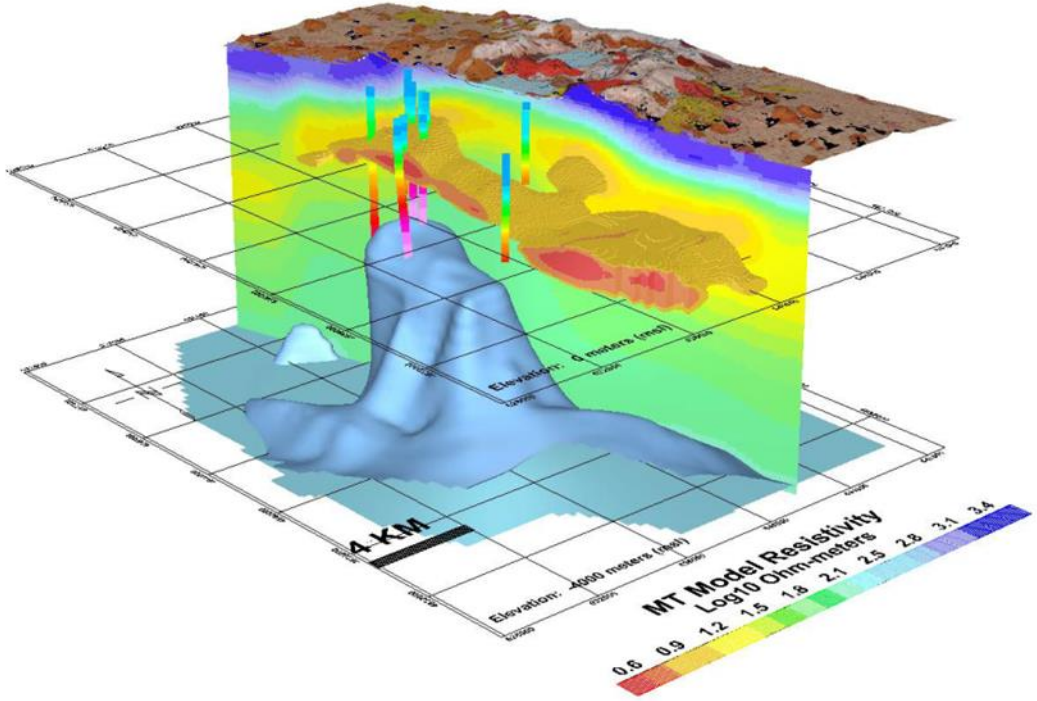
Scheduled for 2021 launch

研究方向#2：大地电磁

- Combine multiple surface EM measurements to probe Earth's interior
- My contribution: parametric signal processing method robust to electromagnetic signal contamination

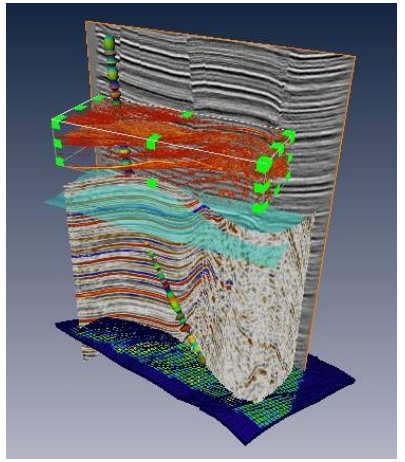


Massive computation



对商业和科技的影响

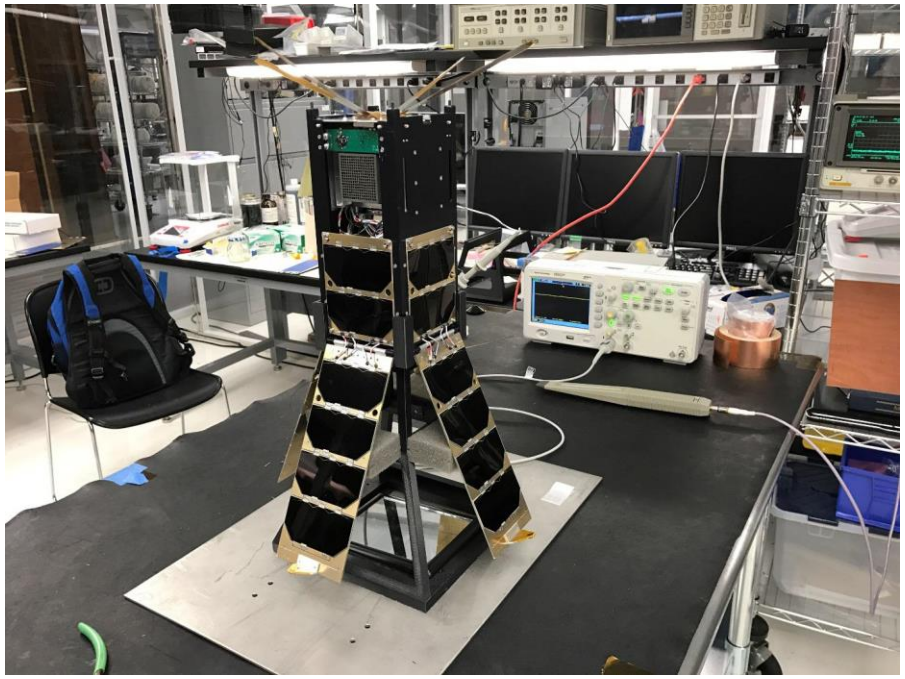
- **Commercial motivations:**
  - Mineral, hydrocarbon, ground water exploration
- **Scientific motivations:**
  - Earthquake fault zone characterization
  - Insight into fundamental geologic processes
- “Parametric Electromagnetic Transfer Function Estimation” project funded by the NSFC Research Fund for International Young Scientists



国家自然科学基金委员会
NSFC

研究方向#3：纳米卫星研究实验室

- Sensor and computer processing costs continuously decrease
- Small satellites provide a viable platform for real science

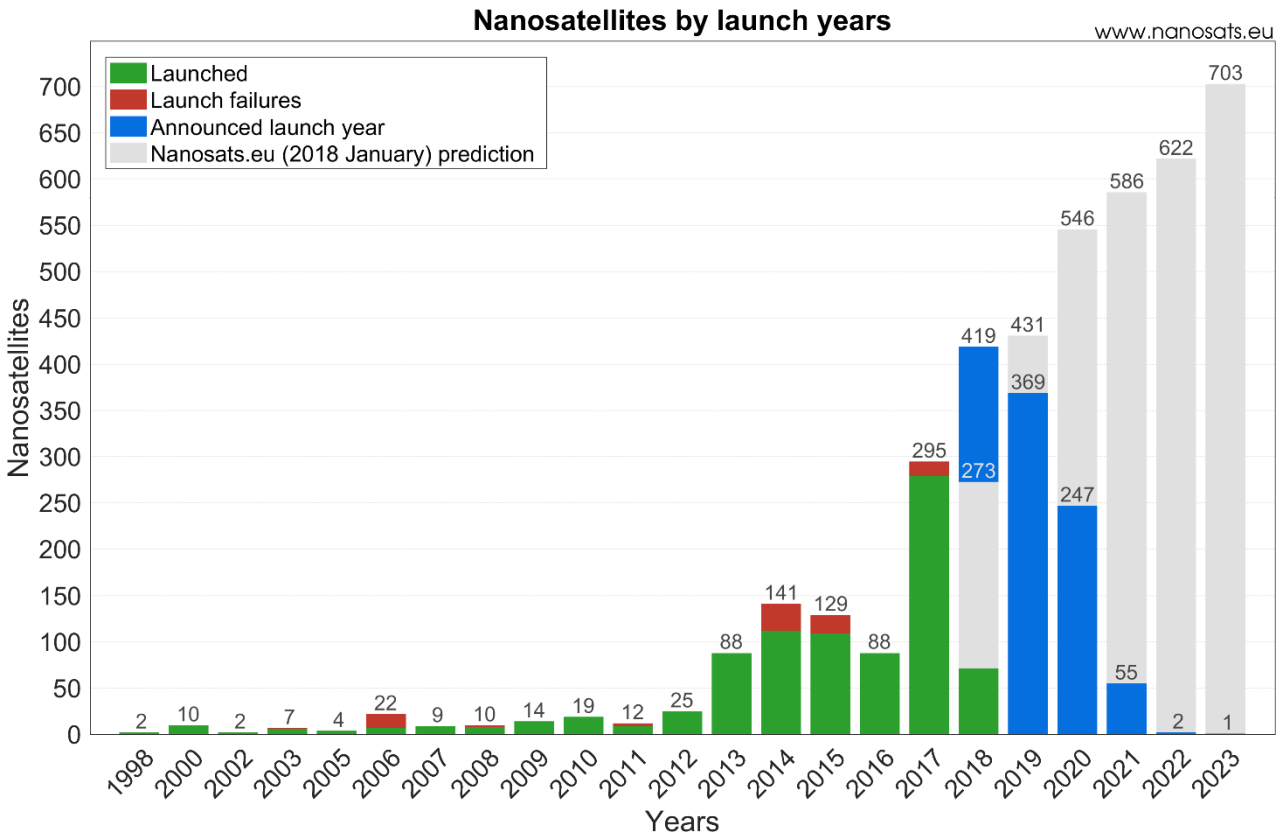


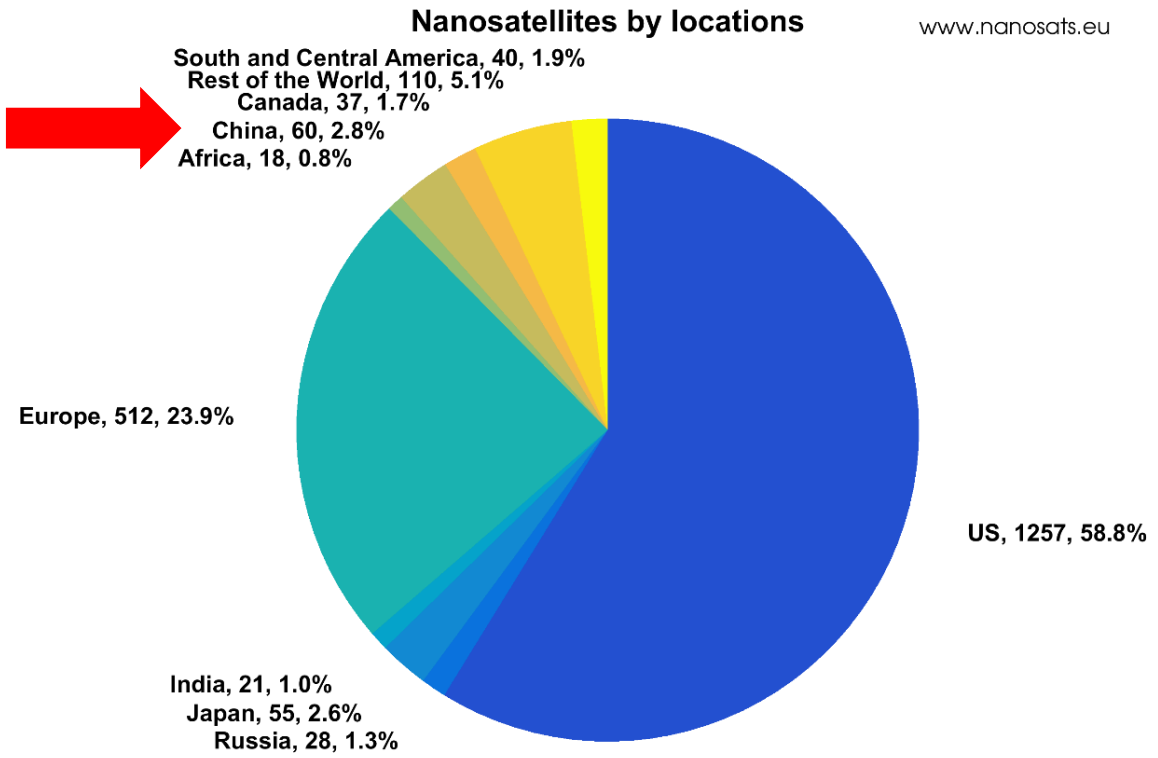
Development / testing in university lab

Operation in space

纳米卫星 – 新兴技术

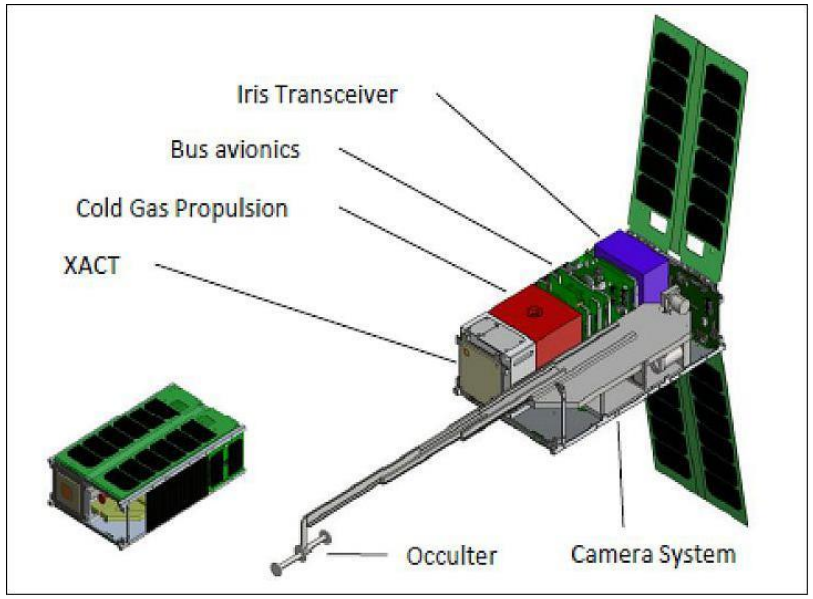
- China currently contributes only a small share (< 3%) of nanosatellites





纳米卫星研究计划

- Fleet of Sun monitoring satellites are aging (>10 and >20 years old)
- **Plan**: design and deploy nanosatellite coronagraph instrumentation



(JHU mission concept)

Broader Impact:

Inspire and train the next generation of Chinese space scientists

政府支持与资源互补

- **Resources available at the ZJU International Campus**
  - Generous startup package (Haining City government)
  - Brilliant students (1 Ph.D. student / year)
  - Space to develop research laboratories
  - Multidisciplinary program structure

- **My contributions to the International Campus**
  - Multidisciplinary research experience
  - International scope and vision
  - Inspiring research projects

总结

- **Strong research credentials**
  - Numerous (>20) publications in prestigious, international journals
  - Demonstrated recognition through paper citations (>700)
  - NSFC funding, three-time NASA review panelist

- **Unique scope and vision**
  - Research experience spans the space weather system
  - Published contributions to statistics, computation, and space science

- **Research program is poised for impact**
  - Meets China’s needs identified by the NSFC Geophysics and Space Science program