LAMOST-Kepler project
description of a lifetime

Peter De Cat
Royal Observatory of Belgium (Brussels, Belgium)

Jianning Fu
Beijing Normal University (Beijing, China)

Before conception

- 2003/10/20: first contact with Jianning Fu (Dubrovnik, Croatia)

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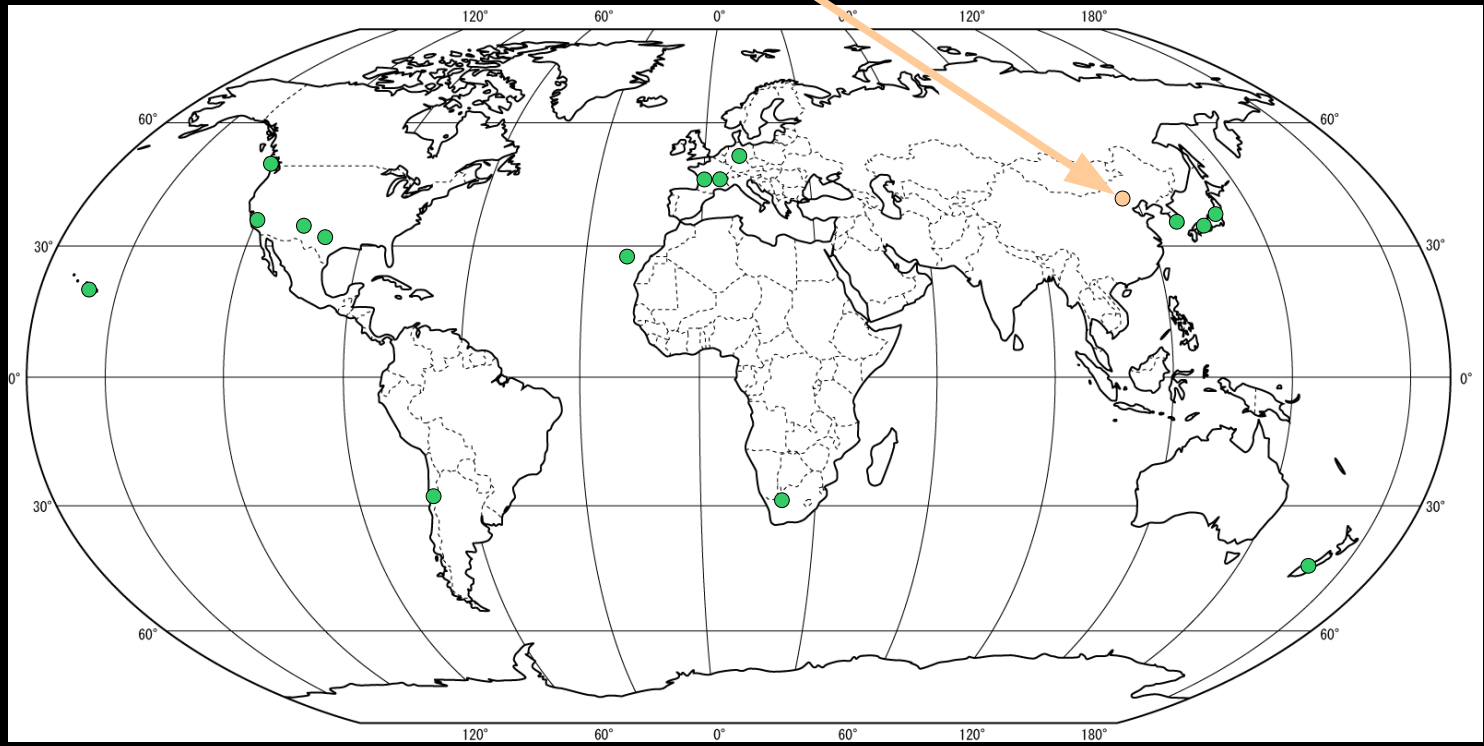

Peter De Cat (Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium; Peter.DeCat@oma.be)
Third LAMOST-Kepler/TESS workshop (2004/05/21-2004/05/24, Beijing Normal University, Beijing, China)

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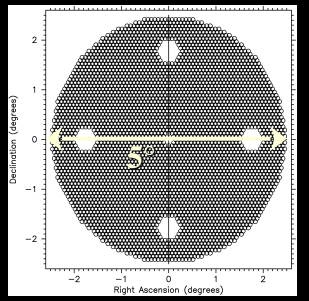
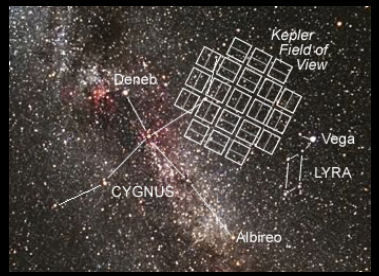
→ Large Sky Area Multi-Object Fiber Spectroscopic Telescope

- Size: 4.0-m telescope
- Field of View: circular with diameter of 5° on sky (~20 deg^2)
- Fibers: #4000
- Wavelengths: 370 – 900 nm
- Resolution: 1000-2000 (low) / 5000-10000 (medium)
- Targets: > 5 000 000 (stars, galaxies, QSOs)

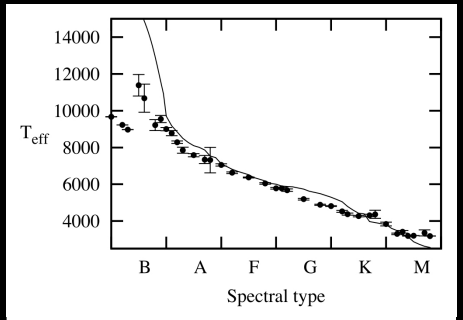


Unique combination of large multi-fiber telescope with wide field-of-view

→ NASA mission Kepler



- primary mirror: 1.2-m
- launch on 2009/03/07 (lifetime ~3.8 years after failure on 2013/05/14)
- continuous monitoring of 1 star field in Cygnus-Lyra region
- broad band photometry with accuracy of few ppm
- main scientific goals
  - ✔ discover Earth-size planets (transit method)
  - ✔ characterizing planet-hosting stars by means of asteroseismic methods
  - ✔ opportunity for asteroseismic investigation of stars covering H-R diagram



Balona et al. (2011, MNRAS 413, 2403)

Need for accurarte stellar parameters

Peter De Cat (Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium; Peter.DeCat@oma.be)

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Collaboration with subchairs of Kepler Asteroseismic Science Consortium

→ to cover whole Kepler field-of-view

→ to characterize targets in homogeneous way
  - spectral type
  - any peculiarities
  - T_{eff}, logg, metallicity

→ with low-resolution spectroscopy
  - radial velocity ⇒ binaries, cluster membership
  - rotation velocity ⇒ restriction on vsini

→ because it is the only instrument to observe thousands of targets efficiently
  - brightest targets ($K_p \leq 10.5$ mag): with 2-m class telescopes
  - LAMOST: focus on fainter targets

Pregnancy

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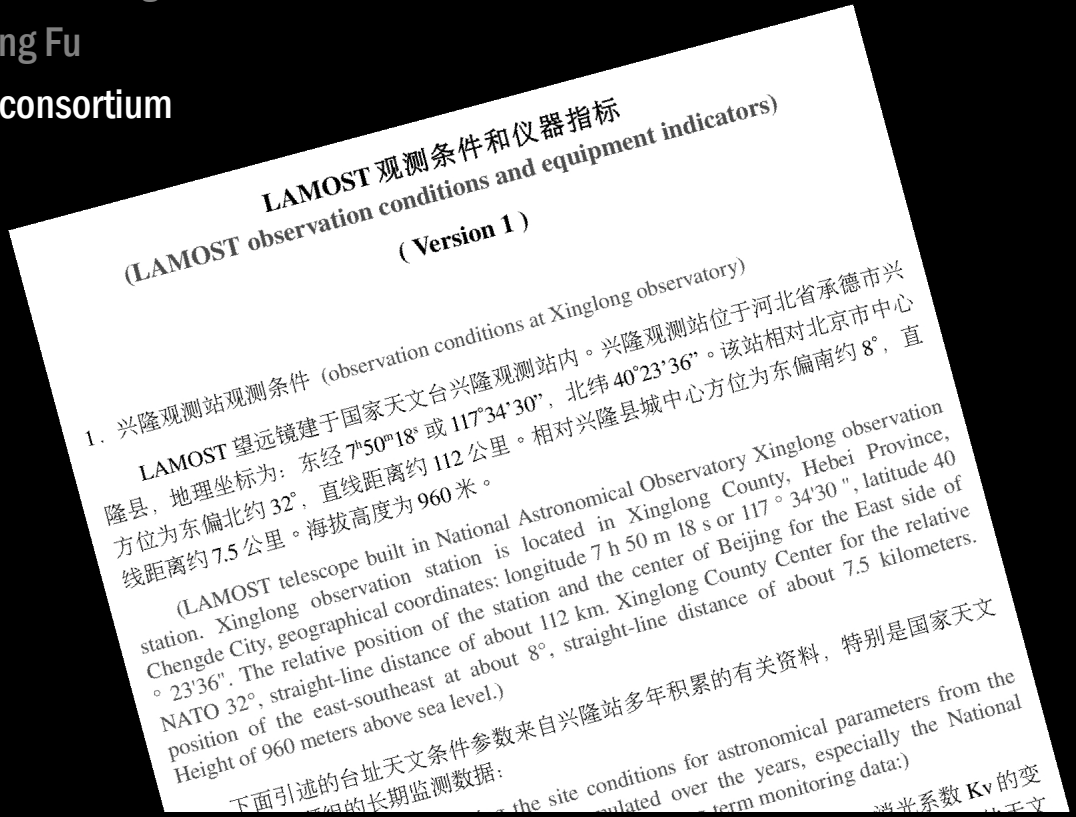

LAMOST 观测条件和仪器指标
(LAMOST observation conditions and equipment indicators)
(Version 1)

1．兴隆观测站观测条件 (observation conditions at Xinglong observatory)

LAMOST 望远镜建于国家天文台兴隆观测站内。兴隆观测站位于河北省承德市兴隆县，地理坐标为：东经 $7^h50^m18^s$ 或 117°34'30"，北纬 40°23'36"。该站相对北京市中心方位为东偏北约 32°，直线距离约 112 公里。相对兴隆县城中心方位为东偏南约 8°，直线距离约 7.5 公里。海拔高度为 960 米。

(LAMOST telescope built in National Astronomical Observatory Xinglong observation station. Xinglong observation station is located in Xinglong County, Hebei Province, Chengde City, geographical coordinates: longitude 7 h 50 m 18 s or 117 ° 34'30 ", latitude 40 ° 23'36". The relative position of the station and the center of Beijing for the East side of NATO 32°, straight-line distance of about 112 km. Xinglong County Center for the relative position of the east-southeast at about 8°, straight-line distance of about 7.5 kilometers. Height of 960 meters above sea level.)

下面引述的台址天文条件参数来自兴隆站多年积累的有关资料，特别是国家天文

the site conditions for astronomical parameters from the
ulated over the years, especially the National
term monitoring data:)

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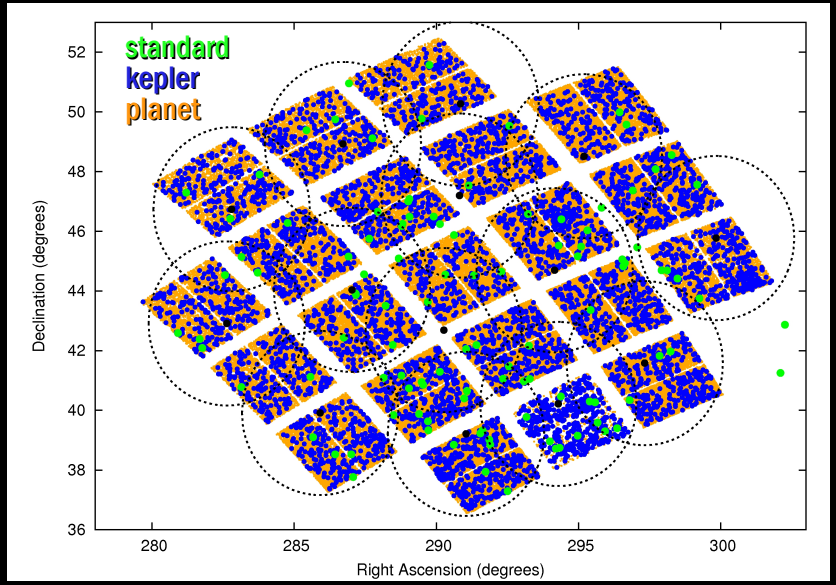


大天区面积多目标光纤光谱望远镜
(LAMOST)
科学试观测计划建议书

课 题 名 称： Characterization of targets of the Kepler Asteroseismic Science Consortium (KASC)
申 请 者： Peter De Cat
工作单位： Royal Observatory of Belgium
通讯地址： Ringlaan 3
邮政编码： B-1180 Brussels (Belgium)
电子信箱： Peter.DeCat@oma.be
电 话： +32 2 3736785 传 真： +32 2 3749822
20 February 2010

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- 2010/12: observation details of LAMOST-Kepler proposal

Birth

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- 2011/05/30: first observations for LAMOST-Kepler proposal

Childhood

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- 2010/07/14: submission second version of LAMOST-Kepler proposal
- 2010/12: observation details of LAMOST-Kepler proposal
- 2011/05/30: first observations for LAMOST-Kepler proposal
- 2012/05: first spectra distributed and start of analysis
  - → Asian team (Fu, *Zong*, Shi, *Luo*, Zhang et al.)
  - → European team (*Frasca*, Catanzaro, Alonso-Santiago, *Molenda-Żakowicz*, De Cat et al.)
  - → American team (*Gray*, Corbally et al.)

Win-win opportunity for both LAMOST community and Kepler community

Adolesence

Key papers

- De Cat et al., 2015, ApJS 220, 19 — "LAMOST observations in the Kepler field: I. Database of low-resolution spectra" (2011/05-2014/09)
- Grey et al., 2016, AJ 151, 13 — "LAMOST observations in the Keperl field: Spectral classification with the MKCLASS code" (2011/05-2014/09)
- Ren et al., 2016, ApJS 225, 28 — "LAMOST observations in the Kepler field: Analysis of the stellar parameters measured with LASP based on low-resolution spectra" (2012/06-2014/09)
- Frasca et al., 2016 A&A 594, A39 — "Activity indicators and stellar parameters of the Kepler targets: An application of the ROTFIT pipeline to LAMOST-Kepler stellar spectra" (2011/05-2014/09)
- Zong et al., 2018, ApJS 238, 30 — "LAMOST observations in the Kepler field: II. Database of the low-resolution spectra from the five-year regular survey" (2015/05-2017/05)
- Fu et al., 2020, RAA 20, 167 — "Overview of the LAMOST-Kepler project" (2011/05-2020/09)
- Zong et al., 2020, ApJS 251, 15 — "Phase II of the LAMOST-Kepler/K2 survey: I. Time series of medium-resolution spectroscopic observations" (2019/01-2019/06)
- Wang et al., 2020, ApJS 251, 27 — "LAMOST observations in 15 K2 campaigns: I. Low-resolution spectra from LAMOST DR6" (2015/12-2018/01)
- Frasca et al., 2022, A&A 664, A78 — "Characterization of Kepler targets based on medium-resolution LAMOST spectra analysed with ROTFIT" (2017/09-2018/05)

KSB - ORB

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~50% non-Chinese first authors

"LAMOST observations in the Kepler field: I. Database of low-resolution spectra" (2011/05-2014/09)

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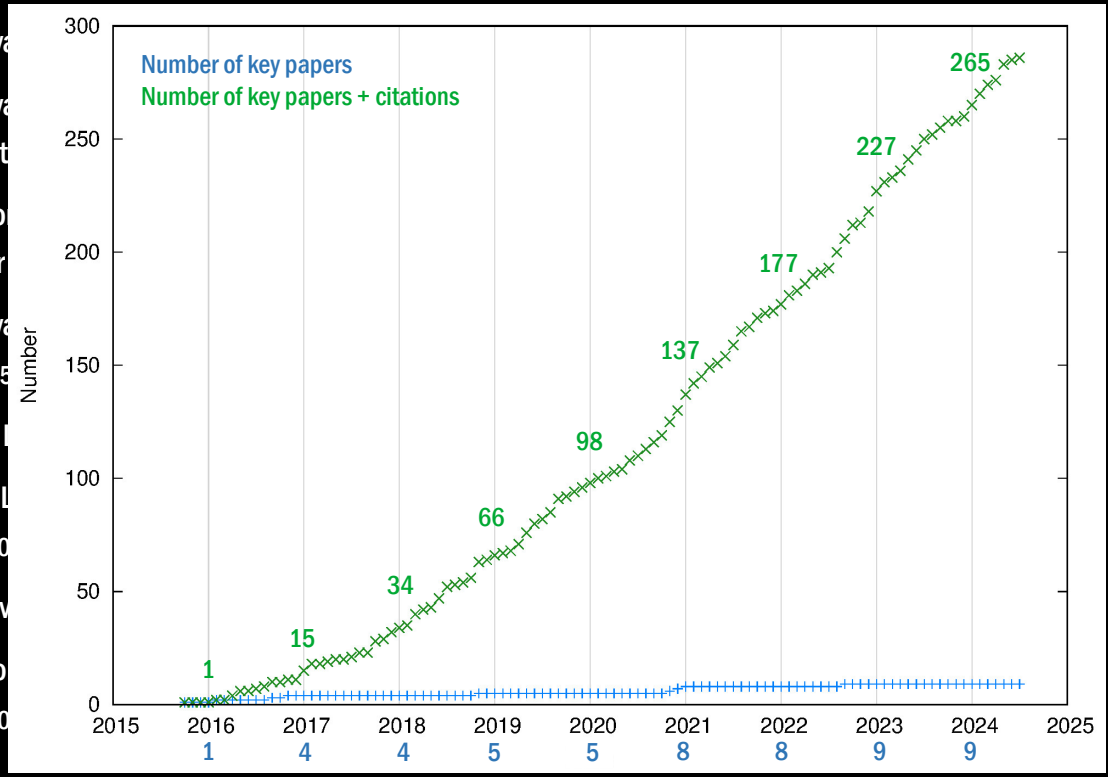

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Adulthood

Workshops

- 2014/08/18-1014/08/22: first LAMOST-Kepler workshop (Beijing, China)
  - → Presentation of the LAMOST facility and the opportunities it opens for the international scientific society
  - → Presentation of the first results

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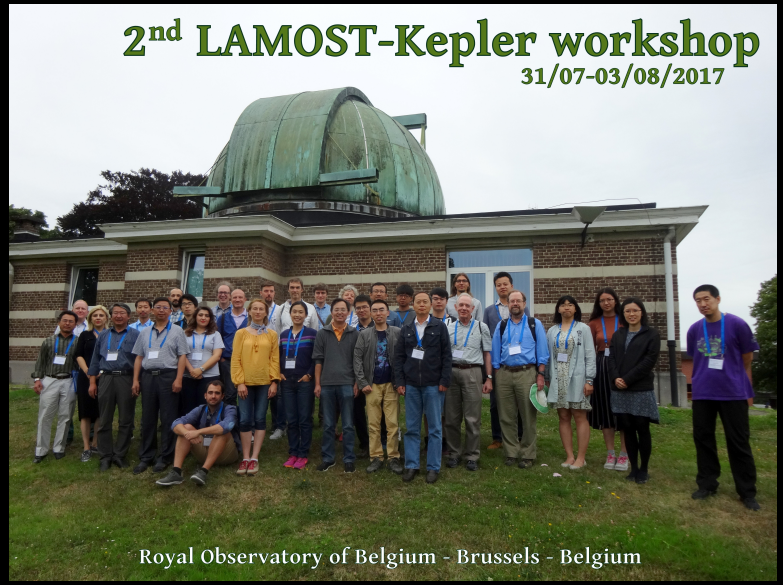
  - → Presentation of the first results
- 2017/07/31-2017/08/03: second LAMOST-Kepler workshop (Brussels, Belgium)
  "LAMOST in the era of large spectroscopic surveys"
  - → Evaluation after first regular survey of 5 years



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  - → Evaluation after first regular survey of 5 years
- 2024/05/21-2024/05/24: third LAMOST-Kepler/TESS workshop (Beijing, China)
  "Synergies between ground-based spectroscopic surveys and space-based photometric missions"
  - → Evaluation after second regular survey of 5 years
  - → Importance as source of ground-based follow-up observations for space missions

Thank you!
Welcome and enjoy!