

Hesai Technology (禾赛科技) and its “Chinese Eye”

Hesai Technology (禾赛科技) is a major LiDAR-focused technology corporation headquartered in Shanghai, China. The company’s products are used in a wide range of applications, including passenger and commercial vehicles with Advanced Driver Assistance Systems (ADAS), autonomous driving vehicles, and robotic applications such as last-mile delivery robots and Automated Guided Vehicles (AGVs). Hesai handles its manufacturing in-house in addition to its LiDAR R&D and design divisions, with R&D capabilities stretching across optics, mechanics, electronics, and software. Hesai has established offices in Shanghai, Palo Alto, California, and Stuttgart, Germany, with customers spanning over 40 countries. Major concerns have been raised about whether Hesai is involved in the development of dual-use technology, given LiDAR’s major applications in autonomous military vehicles. As a result, Hesai has been added to the U.S. Department of Defense’s List of PRC Military Companies (established via the 2021 NDAA’s section 1260H as a companion to the Department of Commerce’s Entity List) less than a year after its 2023 IPO.

Hesai currently aims to contest this designation, despite the overwhelming dual-use nature of China’s LiDAR industry and the technology itself. China’s military technical and academic institutes such as the National University of Defense Technology (国防科学技术大学, or NUDT), service institutes such as the PLA Navy’s Dalian Naval Academy (海军大连舰艇学院), and a variety of operational units are all conducting extensive research into military applications of LiDAR,¹ as are Hesai’s closest comparable firms in China’s private sector – a fact that they have fully acknowledged in their past Chinese-language corporate filings, as discussed below.²

Hesai’s main campus is located in Shanghai’s Qingpu District on the 9th floor of building 2-B of the Hongqiao World Center, No. 1588 Zhuguang Road (上海市青浦区诸光路 1588 号虹桥世界中心 2 栋 B 幢 9 楼).³



¹ See, for example, http://journal.nudt.edu.cn/gfkjdxxb/ch/reader/view_abstract.aspx?file_no=201902018&flag=1 and <https://zhuanlan.zhihu.com/p/666077171>

² <https://static.sse.com.cn/stock/information/c/202101/e999c0661a644c928d259e4fb47e358b.pdf>

³ <http://www.job.cqu.edu.cn/company/view/id/535094>



Figures 1 and 2: Location of Hesai’s Main Shanghai Campus, and Hesai’s Major Worldwide Facilities

According to corporate records and commercial databases, however, Hesai has a number of other facilities across Shanghai, including multiple locations in the Jiading district and one in the Changning district, as well as offices in California and Germany. Hesai has also established a Chongqing facility. The addresses of its various corporate facilities in China are:

- 上海市嘉定区新徕路 468 号 B 幢
- 上海市嘉定区叶城路 925 号 a4 栋 206 室
- 上海市嘉定区徐行镇嘉朱公路 1284 号
- 上海市嘉定区宝钱公路 3188 号
- 上海市嘉定区娄塘北和公路 225 号
- 上海建工嘉定工业园 2 号楼
- 上海市长宁区昭化路 658 号
- 重庆市南岸区江峡路 1 号 9 幢 4 单元

According to an August 2023 report by the nonpartisan Congressional Research Service on China’s development of LiDAR technology, Hesai “makes autonomous warfighting vehicles for the [Chinese] military and is reportedly tied to the military’s China Electronics Technology

Group Corporation (CETC).”⁴ Both of these assertions appear to directly justify the placement of Hesai on DoD’s PRC Military Companies List.

Although Hesai does not publicly disclose its involvement in military technology development, both its American corporate disclosures for its 2023 NASDAQ listing and its Chinese-language corporate documents make it clear that the company fully understands the dual-use context of the LiDAR technology it develops. In English-language corporate documents, Hesai makes clear that dual-use technology regulations and restrictions from both the Chinese and United States governments are anticipated to impact their business activities.⁵ In Chinese-language corporate disclosures, Hesai goes one step further; in a description of the most comparable firms operating in their industry in China, they note that those firms are engaging in a range of military technology development.⁶

Hesai sees its primary domestic technological competitors with A-listed shares as including:

- Raytron (睿创微纳), a Chinese firm committed to the design and manufacturing of application-specific integrated circuits, including MEMS sensors and infrared imaging products. Many of Raytron’s products are intended for military use, including night vision, precision guidance, photoelectric loads, and military vehicle auxiliary driving systems. Hesai shows a clear understanding of the dual-use nature of Raytron’s driving technology in its filings, noting that its monitoring and auxiliary driving technologies are also used for civilian purposes.
- Autel Technology (道通科技), a major Chinese drone and automotive sensing developer. In recent months, Autel has been the subject of a bipartisan investigation by the U.S. Senate as a threat to U.S. national security interests for the use of its drone technology in both Russia’s ongoing invasion of Ukraine and in China’s domestic surveillance and suppression of the Uyghur ethnic minority.⁷
- Wuhan Guide Infrared Group (高德红外), which develops infrared thermal imaging technology. Hesai explicitly describes Guide Group as emblematic of how “the new private economy can provide the national defense industry with new, fully localized high-tech WQ systems.” Public-domain research has not fully clarified what a ‘WQ’ system is, though one source describes it as being used as an anti-tank weapon.⁸

As for Hesai’s involvement with the China Electronics Technology Group Corporation (中国电科), CETC is China’s foremost defense electronics and information technology conglomerate; many of its subsidiaries are on the Entity List. According to reports from industry insiders, the reported linkage between Hesai and CETC involves supplier relationships as well as possible co-location of facilities. A mapping of Hesai and CETC’s respective facilities in Shanghai (see Figures 3 and 4 below) does not show precise overlap between the two, but there is evidence suggesting that Hesai’s Jiading district facilities may be a part of Jiading’s designated Military-Civilian Fusion Zone, a special industrial zone for dual-use technology development.

⁴ <https://crsreports.congress.gov/product/pdf/IF/IF12473>

⁵ https://www.sec.gov/Archives/edgar/data/1861737/000110465923009861/tm2120356-22_f1a.htm

⁶ <https://static.sse.com.cn/stock/information/c/202101/e999c0661a644c928d259e4fb47e358b.pdf>

⁷ <https://dronedj.com/2023/12/04/autel-drone-military-war-illegal/>

⁸ <https://www.yicai.com/news/100290069.html>

The Hesai facilities marked as Facility 4 and Facility 5 in Figure 4 appear likely to be located within Shanghai Jiading’s Military-Civilian Fusion Zone. While the boundaries of the zone are not disclosed in public sources, a press release heralding the start of the zone mentioned several companies as constructing new facilities within the zone, including Shanghai JunQian Sensing Technology Co. Ltd. (上海钧嵌传感技术有限公司 or JSensor).⁹ Shanghai JunQian’s new Jiading facilities for the Military-Civilian Fusion Zone are located exactly between Hesai Facility 4 and Hesai Facility 5, as shown below:



Figure 5: Proximity of Shanghai JunQian in Jiading (Red Pin) to Hesai Facility 5 (Green Pin)

The presence of Hesai’s Jiading facilities inside the Military-Civilian Fusion Zone would serve as strong evidence of intentional dual-use technology development. Companies in the zone are given major financial and regulatory incentives specifically because of their expected contribution to China’s national security and warfighting capabilities; firms are not located there by accident or happenstance.

Aside from colocation, Hesai has explicitly admitted its supplier relationship with CETC, though only in Chinese-language documents. According to Hesai’s Shanghai IPO prospectus documents

⁹ <http://finance.china.com.cn/roll/20190429/4966552.shtml>

from 2021, CETC's 13th Research Institute (中国电科第十三研究所) was Hesai's 3rd largest supplier in 2019, providing Hesai with "laser devices," in a deal valued at just over 1 million USD.¹⁰ The CETC 13th RI (also known as the Hebei Semiconductor Research Institute or HSRI) features prominently on the Department of Commerce Entity List, along with 12 of its subordinate institutions, and had already been designated as such before 2019.¹¹ Given Hesai's preexisting corporate relationship with the HSRI, HSRI's role in semiconductor development, and Hesai's recent stated desire to participate in indigenous chip development, further cooperation between the two firms is quite possible. Personnel of defense-focused CETC research institutes have also subsequently gone to work for Hesai, reflecting the overlap of their industrial ecosystems.¹²

Hesai also appears to have numerous supply chain linkages into China's defense science and technology development. For example, Hesai supplies LiDAR technology to the AI laboratory of the Beijing University of Aeronautics and Astronautics (北京航空航天大学, also known as BUAA or Beihang), a member of an elite tier of universities researching cutting-edge military technology that are known as the "Seven Sons of National Defence."¹³ Hesai has also partnered with a number of firms currently or previously on the Department of Commerce Entity List, such as Xiaomi (as an investor), DJI, and SenseTime (as a major supplier).¹⁴ Industry executives in China have even commented on how Hesai's collaboration with firms in China's defense industry may understandably arouse suspicion with regulators in the United States.¹⁵ In addition to these international concerns, domestically Hesai technology appears to be used in autonomous security vehicles deployed in China's internal repression of the Uyghur minority in Xinjiang through its partnership with the autonomous security vehicle-focused firm UISEE Technology.¹⁶

Most notably of all, Hesai's LiDAR technology has been used in the PLA's autonomous military vehicles through a partnership with UISEE and Dongfeng Motors. As seen in the still image below from an official CCTV broadcast on cutting-edge defense technology, Hesai's LiDAR technology is clearly visible on one of Dongfeng's autonomous military vehicles, while a caption on the side proclaims this technology to be "a trump card on the battlefield of the future." A number of other PLA autonomous vehicles also use LiDAR that closely resembles Hesai's technology, though with any brand name already strategically removed; it is unclear whether this represents an intentional effort to obscure Hesai's boundaries or a simple case of mistaken identification.¹⁷

¹⁰ <https://static.sse.com.cn/stock/information/c/202101/e999c0661a644c928d259e4fb47e358b.pdf>

¹¹ <https://www.bis.doc.gov/index.php/documents/federal-register-notices-1/2250-83-fr-37423-entity-list-final-rule-8-1-18/file>

¹² <https://theorg.com/org/hesai-technology/org-chart/yanwu-xu>; for an explanation of how the East China Research Institute of Electronic Engineering / ECRIEE is an alias of the CETC 38th Research Institute and their defense technology development activities, see for example <https://www.defensenews.com/pentagon/2016/03/14/china-reveals-origin-of-aewc-radar/>

¹³ <https://www.cpc360.com/new/public/?s=make/ztb/ztbDetailById/mob/0/detailType/detail/id/39992023>

¹⁴ <https://www.hesaitech.com/hesai-receives-additional-funding-from-xiaomi-to-reach-370-million-series-d-round/>; https://pdf.dfcfw.com/pdf/H2_AN202101071448531255_1.pdf;

<https://web.archive.org/web/20171117155703/https://enterprise.dji.com/cn/news/detail/dji-hs>

¹⁵ <https://www.leiphone.com/category/transportation/6S9L80ET6xxxBRNv.html>

¹⁶ <https://www.hesaitech.com/how-does-uissee-become-the-ai-driver-of-the-world/>

¹⁷ See, for example, https://live.staticflickr.com/65535/51514600313_ec8fa77201_o.jpg



Figure 6: CCTV Broadcast of Hesai LiDAR (circled) on PLA Autonomous Fighting Vehicle (2022)

Beyond the firm’s myriad institutional and supply chain linkages to China’s military industrial complex, the leadership of Hesai also has clear ties to the Chinese government at the level of core personnel. Hesai was co-founded in 2014 by Li Yifan (李一帆), Sun Kai (孙恺) and Xiang Shaoqing (向少卿), with Li Yifan serving as CEO.¹⁸ Li Yifan (age 37) is a member of the Chinese Communist Party, and in party government documents he is described as closely integrating with government objectives:

Li Yifan, male, Han nationality, born in March 1986, member of the Communist Party of China, co-founder and CEO of Shanghai Hesai Technology Co., Ltd. He actively responded to a series of major national decisions and deployments such as “improving the national innovation system, accelerating the construction of a technologically powerful country, and achieving high-level scientific and technological self-reliance,” leading Hesai Technology to solve the high cost and mass production of LiDAR through original and leading scientific and technological research ... Hesai’s LiDAR has been proven in the marketplace, with customers in more than 90 cities in 40 countries around the world, and it continues to expand the influence of “Intelligent Manufacturing in China” globally. He has been awarded ... as a “National Overseas High-Level Talent Program” Entrepreneurial Talent, and a Shanghai Youth May 4th Medal Model.¹⁹

More disturbingly, in interviews with Chinese state-run media during the first years of Hesai’s existence, Li presented himself as a full-throated Chinese techno-nationalist, with Hesai’s

¹⁸ <https://i.ifeng.com/c/8WqPhtL63Gn>

¹⁹ <https://www.jingnan.gov.cn/rmtzx/003008/003008005/20230823/2755b162-97fe-4ced-b5a9-c8e782dc3650.html>

LiDAR technology described as a “Chinese Eye” (中国眼) developed for the benefit of China’s national interests. As Li put it explicitly in one such interview:

Initially, there was an opportunity [for Li’s team] to establish an American company, but Hesai chose to become a Chinese company because it firmly believed that greater value could be created in China. “As a Chinese person, I think it is important for us to be able to let our country enjoy these best technologies first,” Li Yifan said.

Until it became essential for his business interests to deny the obvious to U.S. regulators and courts, Li clearly understood his work at Hesai to be a part of a broader techno-nationalist project, with Hesai existing within a larger ecosystem of Chinese LiDAR research that includes military and dual-use R&D as well as civilian applications, aimed at giving China both an economic and national security edge over the United States and its allies through the development of superior autonomous vehicles.

Appendix A: Additional Chinese LiDAR Research of Interest

In addition to Hesai's technological development, the following is a selection of China's recent military, civilian, and dual-use LiDAR research published in academic fora:

Title (CN)	Title (EN)	Authors	First Author (CN)	1st Author Affiliation	Funding Sources
激光雷达探测整层大气昼夜气溶胶光学厚度	LiDAR detection of diurnal variation of whole atmosphere aerosol optical depth	汪惜今; 徐青山; 范传宇; 程晨; 戚鹏; 徐赤东	Wang Xijin (汪惜今)	Centre for Basic Science, Anhui Institute of Optics and Fine Mechanics, HFIPS, Chinese Academy of Sciences; Hefei 230031 (中国科学院合肥物质科学研究院安徽光学精密机械研究所基础科学研究中心; 合肥 230031); University of Science and Technology of China; Hefei 230026 (中国科学技术大学; 合肥 230026)	科技部国家重点研发计划 (2016YFE0201400); 中国科学院合肥研究院院长基金资助 (YZJJ2021QN01)
单光子激光雷达研究进展	Review of Advances in Single-Photon LiDAR	张汉熠; 赵新宇; 张益成; 张蜡宝; 孙鸣捷	Zhang Hanyi (张汉熠)	School of Instrumentation and Optoelectronic Engineering, Beihang University; Beijing100191 (北京航空航天大学仪器科学与光电工程学院; 北京 100191)	Funding code: 国家自然科学基金优秀青年科学基金 (61922011); 国家自然科学基金企业联合基金重点项目 (U21B2034)
非视域三维成像激光雷达的研究进展	Research advances on non-line-of-sight three-dimensional imaging LiDAR	靳辰飞; 田小芮; 唐劭; 王峰; 杨杰; 乔凯; 史晓洁; 张思琦	Jin Chenfei (靳辰飞)	School of Physics, Harbin Institute of Technology; Harbin 150001 (哈尔滨工业大学物理学院; 黑龙江哈尔滨 150001)	
三维激光雷达-相机间外参的高效标定方法	High efficient extrinsic parameter calibration method of 3D LiDAR-camera system		刘今越; 唐旭; 贾晓辉; 杨冬; 李铁军		国家重点研发计划 (2017YFB1301002)、国家自然科学基金 (U1813222)、河北省自然科学基金 (E2017202270)

					项目资助
基于卷积神经网络的ICESat-2光子点云去噪分类	Denoising and Classification of ICESat-2 Photon Point Cloud based on Convolutional Neural Network		Lu Dajin (陆大进)	Faculty of Land Resource Engineering, Kunming University of Science and Technology; Kunming 650093 (昆明理工大学国土资源工程学院; 昆明 650093)	Guangxi Natural Science Fund for Innovation Research Team (No.2019GXNSFG A245001) (广西自然科学基金—创新研究团队项目 (2019GXNSFGA245001)); National Natural Science Foundation of China (No.4207140) (国家自然科学基金项目) (42071405); Youth Innovation Pro-motion Association Chinese Academy of Sciences (No. 2019130) (中国科学院青年创新促进会 (2019130))
安防激光雷达研究进展	Research Progress on Security LiDAR	宋召奇; 朱精果; 解天鹏; 李锋; 姜成昊; 郭文举; 王春晓; 蒋衍	Song Zhaoqi (宋召奇)	Institute of Microelectronics, Chinese Academy of Sciences; Beijing 100029 (中国科学院微电子研究所; 北京 100029); University of Chinese Academy of Sciences; Beijing 100049 ()	
激光雷达测绘卫星发展及应用	Development and application of LiDAR mapping satellite	方勇; 曹彬才; 高力	Fang Yong (方勇)	State Key Lab of Geoinformation Engineering; Xi'an 710054 (地理信息工程国家重点实验室; 陕西西安 710054); Xi'an Research Institute of Surveying and Mapping; Xi'an 710054 (西安测绘研究所; 陕西西安 710054)	
APD 三维成像激光雷达研究	Research progress of APD three-dimensional	曹杰; 郝群; 张芳	Cao Jie (曹杰)	Bionic Robot Key Laboratory of Ministry of Education, School of	

进展	imaging LiDAR	华; 徐辰宇; 程阳; 张佳利; 陶禹; 周栋; 张开宇		Optics and Photonics, Beijing Institute of Technology; Beijing 100081 (北京理工大学光电学院 仿生机器人教育部重点实验室; 北京 100081)	
偏振成像激光雷达与短波红外复合光学接收系统设计与分析	Design and analysis of polarization imaging LiDAR and short-wave infrared composite optical receiving system	冯帅; 常军; 胡瑶瑶; 吴昊; 刘鑫	Feng Shuai (冯帅)	School of Optics and Photonics, Beijing Institute of Technology; Beijing 100081 (北京理工大学光电学院; 北京 100081)	National Natural Science Foundation of China (Grant No. 61471039) (国家自然科学基金 (批准号: 61471039))
应用于激光雷达(LiDAR)测量系统的单芯片全集成信号处理电路系统的设计	Amplifying Circuit Interface Model for LiDAR Signal Processing Systems	刘汝卿; 蒋衍; 姜成昊; 李锋; 朱精果	Liu Ruqing (刘汝卿)	Institute of Microelectronics, Chinese Academy of Sciences; Beijing 100094 (中国科学院微电子研究所; 北京 100094)	
基于多引导结构感知网络的深度补全	Depth completion method based on multi-guided structure-aware networks	孙虎; 金宇强; 张文安; 付明磊	Sun Hu (孙虎)	College of Information Engineering, Zhejiang University of Technology; Hangzhou 310023 (浙江工业大学信息工程学院; 杭州 310023); Zhejiang Provincial United Key Laboratory of Embedded Systems; Hangzhou 310023 (浙江省嵌入式系统联合重点实验室; 杭州 310023)	National Natural Science Foundation of China (62173305, 62111530299) (国家自然科学基金项目; 62173305, 62111530299)
MEMS 激光雷达综述	Review of MEMS LiDAR	乔大勇; 苑伟政; 任勇			
激光雷达与相机融合标定技术研究进展	Advancements in fusion calibration technology of LiDAR and camera	王世强; 孟召宗; 高楠; 张宗华	Wang Shiqiang (王世强)	School of Mechanical Engineering, Hebei University of Technology; Tianjin 300130 (河北工业大学机械工程学院; 天津 300130)	National Natural Science Foundation of China (52275485) (国家自然科学基金项目 (52275485))
机载激光雷达	A Review of Airborne LiDAR	张吟	Zhang Yin (张吟)	No. 710 R&D Institute, CSSC; Yichang 443003	

浅水小目标探测技术综述	Technology for Shallow Water Small Target Detection			(中国船舶集团有限公司第七一〇研究所; 湖北宜昌 443003); Qingjiang Innovation Center; Wuhan 430076 (清江创新中心; 湖北武汉 430076)	
基于阈值的激光雷达 K 均值聚类算法	LiDAR K-means clustering algorithm based on threshold	夏显召	夏显召		
机载激光雷达在水下地貌识别与断裂构造精细解译中的应用	Application of airborne LiDAR to identification of underwater geomorphology and fine interpretation of faults	刘刚; 金鼎坚; 吴芳; 于坤; 李奇; 张文凯; 王建超	Liu Gang (刘刚)	China Aero Geophysical Survey & Remote Sensing Center for Natural Resources; Beijing 100083 (中国自然资源航空物探遥感中心; 北京 10008)	国家高分专项“高分航空载荷自然资源调查应用示范”(04-H30G01-9001-20/22; 中国地质调查局项目“重要海峡通道遥感地质调查”(DD20191011)
频率调制连续波激光雷达测量技术的非线性校正综述		李超林			
三维成像激光雷达应用的亚纳秒激光器研究进展	Research progress of sub-nanosecond lasers for 3D imaging LiDAR	位超杰; 闫仁鹏; 李旭东; 孟祥熙; 刘欣阳	Wei Chaojie (位超杰)	National Key Laboratory of Science and Technology on Tunable Laser, Harbin Institute of Technology; Harbin 150001 (哈尔滨工业大学 可调谐 (气体) 激光技术国家重点实验室; 哈尔滨 150001)	
拉曼-米激光雷达污染环境气溶胶散射系数反演		张寅超	张寅超		
极地海冰密集度和厚度遥感反演方法研究	Research on polar sea ice concentration and thickness retrieval using remote sensing observation	梁爽	Liang Shuang (梁爽)	Aerospace Information Research Institute, Chinese Academy of Sciences (中国科学院空天信息创新研究院)	航天系统部预研项目 (105020101, 105020303)

单目相机—3 维激光雷达的 外参标定及融 合里程计研究	Extrinsic Calibration and Fused Odometry for Monocular Camera and 3D LiDAR	肖军浩; 施成浩; 黄开宏; 于清华	Xiao Junhao (肖军浩)	College of Intelligence Science and Technology, National University of Defense Technology; Changsha 410073 (国防科技大学 智能科学学院; 湖南长 沙 410073); School of Computer Science, University of Lincoln	
LiDAR/IMU 紧 耦合的实时定 位方法	LiDAR/IMU tightly coupled real-time localization method	李帅鑫; 李广云; 王力; 杨 啸天	Li Shuaixin (李帅鑫)	State Key Laboratory of Geo-Information Engineering, Xi'an 710054 (地理信息工程 国家重点实验室; 西安 710054)	地理信息工程国家 重点实验室基金 (SKLGIE2018-M- 3-1); 国家重点研 发计划 (2017YFF0206001) ; 国家自然科学基金 基金 (41501491)
近程动态范围 激光雷达测距 系统设计及误 差分析	Design Of LiDAR Ranging System for Short- distance Dynamic Range And Error Analysis	王皓; 罗 沛; 李小 路	Wang Hao (王皓)	School of Instrumentation Science and Opto-electronics, Beihang University; Beijing 100083 (北京 航空航天大学仪器科 学与光电工程学院; 北 京 100083)	
基于激光雷达 的垂直能见度 反演算法及其 误差评估		宋海润; 晓蕾; 李 浩	Song Hairun (宋海润)	School of Meteorology and Oceanography, National University of Defense Technology; Nanjing 211101 (国防 科技大学气象海洋学 院; 南京 211101)	国家自然科学基金 项目 (41575025)
固态激光雷达 研究进展	Research progress in solid- state LiDAR	陈敬业; 时尧成	Chen Jingye (陈敬业)	State Key Laboratory of Modern Optical Instrumentation, Zhejiang University; Hangzhou 310058 (浙 江大学现代光学仪器 国家重点实验室; 杭州 310058)	国家自然科学基金 资助项目 (11861121002)
三维激光雷达 在无人车环境 感知中的应用 研究	Application research of three- dimensional LiDAR in unmanned vehicle environment perception	张银; 任 国全; 程 子阳			
激光雷达探测	Review of advances in	刘博; 于	Liu Bo (刘)		

及三维成像研究进展	LiDAR detection and 3D imaging	洋; 姜朔	博)		
星载激光雷达森林探测进展及趋势	Status and development of spaceborne LiDAR applications in forestry	庞勇; 李增元; 陈博伟	Pang Yong (庞勇)	Institute of Forest Resource Information Techniques, Chinese Academy of Forestry; Beijing 100091 (中国林业科学研究院资源信息研究所; 北京 100091)	国家自然科学基金 (41871278)
基于 ICESat-2 和 GEDI 森林冠层高度和森林地上生物量遥感诊断	Remote sensing diagnosis of forest canopy height and forest above ground biomass based on ICESat-2 and GEDI	林晓娟	Lin Xiaojuan (林晓娟)	Aerospace Information Research Institute, Chinese Academy of Sciences (中国科学院空天信息创新研究院)	