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NewSpace Index, Gunter's Space Page, WMO OSCAR. 52
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1 ().
Spacety, C-
2021–2025
2016–2020
– Planet () Chang Guang Satellite
Technology Corporation ().

The goal of this paper is to assess the existing capabilities of orbital constellations of agriculture-oriented Earth remote sensing spacecraft and the prospects for their development in the nearest future. The paper analyzes the state of the art and the trends in the development of modern orbital constellations of private companies' small Earth remote sensing satellites used in solving agricultural problems. Important sources of information in the space industry, such as NewSpace Index, Gunter's Space Page, and WMO OSCAR, were analyzed. 52 constellations of spacecraft for optical multispectral and hyperspectral, thermal, and microwave (radar) imaging are considered. It is shown that they provide a survey frequency of several times a day. The minimum spatial resolution of optoelectronic surveillance sensors is 1 m (in the panchromatic channel). This allows one to solve problems at an intrafield level, quasi-continuously monitor the plant condition, and use spectral patterns and texture features in solving applied agricultural problems. All the constellations of radar satellites use the X-band, except for the radars of the Spacety constellation (China), which use the C-band. It is shown that the number of constellations of small remote sensing spacecraft in the period 2021–2025 is to be increased by more than three times compared to the period 2016–2020. The number of countries developing constellations of Earth remote sensing satellites has increased significantly. The leading countries and companies in the number and size of constellations are the United States and China and Planet (USA) and Chang Guang Satellite Technology Corporation (China), respectively. Private developers are particularly interested in thermal infrared imaging and hyperspectral optical imaging data. A new line in the private space industry, which is expected to facilitate the solution of agricultural problems, is the deployment of constellations of small meteorological satellites.

Keywords: remote sensing, agriculture, satellite constellation, small satellite, optical imagery, hyperspectral imagery, thermal infrared imaging, synthetic aperture radar.

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[1].

(17–18) % (2019)

[2].

(Variable Rate Technology, VRT),

2016–2020

2021–2025

[1–4],

(400–2500)

(400–1000)

VNIR (visible and near-infrared).

(1000–2500)

(SWIR).

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(),

(5–10)

(Thermal InfraRed, TIR): (8000–14000)

(1 – 1),

(,).

: NewSpace Index (<https://www.newspace.im>), Gunter's Space Page (<https://space.skyrocket.de/index.html>) WMO OSCAR Space-based capabilities (<https://space.oscar.wmo.int/spacecapabilities>).

(CubeSat 6U) 250 .

. 1–4 [5].

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VNIR.

VNIR

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Flock	3,7	424	Planet		2014
SkySat	0,9–2	21	Planet		2013
Jilin-1 Gaofen 02	0,75	4	Chang Guang Satellite (CGS)		2019
Jilin-1 Gaofen-03	1–4	64	Chang Guang Satellite		2019
Jilin-1 Gaofen-04	0,5	1 (?)	Chang Guang Satellite		2022
Jilin-1 Gaofen-06	0,5–5	30	Chang Guang Satellite		2023
Jilin-1 Kuanfu-02	0,5–3	1 (?)	Chang Guang Satellite		2023
Jilin-1 Mofang	< 1	4	Chang Guang Satellite		2022
Jilin-1 Pingtai	–	3	Chang Guang Satellite		2022
Jilin-1 Shipin	1	6	Chang Guang Satellite		2017
NuSat (NewSat)	0,7–4	38	Satellogic		2016
Zhuhai-1 OVS	< 1,9	4	Zhuhai Orbita Aerospace Science & Technology		2017
Tianyi	–	2 (?)	Spacety		2019
GRUS-1	2,5–5	5 (9)	Axelspace		2018
STORK	5	5 (14)	SatRev		2022
Jinzijing (Golden Bauhinia)	4	9 (132)	Beijing Zero G Lab		2021
Pleiades Neo	0,3–1,2	4 (?)	Airbus Intelligence	-	2021
Sejong	5	1 (50)	Hancom Inspace		2022
EOS SAT	1,4–2,8	1 (7)	EOS Data Analytics		2023
Open Constellation	2,5	1 (25)	Open Cosmos	-	2023
EarthDaily	–	0 (8)	EarthDaily Analytics		2024
Pelican	0,3	0 (32)	Planet		2023
JAPETUS	1	0 (20)	Prométhée Earth Intelligence		2023
SatSure	1– ?	0 (4)	SatSure		2024
Guardian	–	1 (20)	Aistech		2022

Planet Flock -
(Dove SuperDove), SkySat, Maxar -
Space Infrastructure. Chang Guang Satellite Technology Corporation
Jilin-1. 2025 -
10 [6].
SkySat, Jilin-1 Gaofen-03, Jilin-1 Shipin Zhuhai-1 OVS
(. 1).
, SkySat Jilin-1 Gaofen-03 -
25–30 ,
60 120 .
Jilin-1 Kuanfu-02 (-
) ,
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150 .
JAPETUS (. 1, 2), ,
, -
Guardian (. 1, 3). -
, -
VNIR SWIR, -
Sejong VNIR. -
. 1 BlackSky, -
, WorldView Legion Maxar -
, 750 ,
. 2 , -
Zhuhai-1 OHS GHOSSt. -
GenMat (600) Hyperfield (100).
GenMat VNIR. -
Hyperfield 2030 . -
Kuva Space, VNIR SWIR , 2 – 3 . -
Hyperfield, , -
Copernicus Contributing Mission [7].
, XCraft -
, Planet
Tanager. 2023 . [8].

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Jilin-1 Guanpu	5	2	Chang Guang Satellite		2019
Zhuhai-1 OHS	10	8	Zhuhai Orbita Aerospace Science & Technology		2018
Hyperfield	25	0 (100) ²	Kuva Space		2023
GHOSSt	8	3 (6)	Orbital Sidekick		2023
Pixxel	10	2 (20)	Pixxel		2022
Wyvern	5,3	2 (36)	Wyvern		2023
Tanager (Carbon Mapper)	30	0 (?)	Planet		2023
Esper	6	0 (18)	Esper Satellite Imagery		2023
Hypersat	9	0 (6)	Hypersat		2023
HySpecIQ	1 – 5	0 (12)	HySpecIQ		2023
JAPETUS	5	0 (20)	Prométhée Earth Intelligence		2023
GenMat	5	0 (600)	GenMat		2023
XCraft	2	0 (12)	Xplore		2023

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Jilin-1 Hongwai	–	8	Chang Guang Satellite		2022
Constellr	30	0 (30)	Constellr		2024
FOREST	80	2 (100)	OroraTech		2022
Hydrosat	–	1 (16)	Hydrosat		2023
HotSat	3,5	1 (8)	SatVu		2023
Guardian	–	1 (20)	Aistech		2022

Jilin-1 Hongwai,

OroraTech Constellr,

100 30

HotSat

SatVu

(MIR): (3400–5000)

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(Stripmap).

. 4 X-
 (2,4–3,5) , Spacety, -
 - (3,8–7,5) X- .
 ICEYE,
 Capella Space Umbra Lab. . 4
 ICEYE,
 ICEYE
 ICEYE (Carcará 1 2),
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Capella-2 (Sequoia, Whitney)	1,2	9	Capella Space		2020
Capella-3 (Acadia)	–	1 (30)	Capella Space		2023
ICEYE	3	20	ICEYE		2018
Spacety (Chaohu)	1	2 (?)	Spacety		2022
QPS-SAR (Spotlight)	< 0,5	3 (36)	iQPS		2019
StriX	3	1 (25)	Synspective		2022
Umbra- SAR	< 0,5	6 (24)	Umbra Lab		2021
PIESAT (Spotlight)	0,5	4	Galaxy Space		2023
XpressSAR	3	0 (4)	XpressSAR		2024

. 4 CHORUS, GenMap SAR-XL. -
 MDA (RADARSAT') -
 CHORUS, - X- .
 , GenMap, -
 S- (7,5–15) X- [9]. -
 Space Alpha ,
 SAR-XL : X L (15–
 30) .
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). 2021–2025 .
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 (2016–2020 .).

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17.11.2023,
05.12.2023