TROY TECHNICAL

SPACE INDUSTRY
WEEKLY REPORT

November 8 - November 14, 2026 | Issue 2026-W45

Mission evidence, launch economics, resilient supply and regulatory access

11	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-11-14 | English edition | fixed approved cover artwork



Space Industry: the boundary moved from isolated claims to qualification evidence

11 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

SIGNAL 01 | COMPONENTS

ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs

Acoustic analysis of three ISS crew members reveals a consistent in-flight decline in the Harmonics-to-Noise Ratio (HNR) across most vowels.

SIGNAL 02 | SPACECRAFT

Starship Fleet Emissions: UV Damage Factors and BC vs CO2

Black carbon (BC) emissions from Starship-scale fleets in the 15-70 km layer cause UV damage approximately 1,900 times greater per kilogram than CO2 over 100 years.

SIGNAL 03 | LAUNCH

Tardigrades in Space: Reversible Dormancy and ISS Revival Results

Tardigrades successfully survived two dormancy-revival cycles during a 64-day mission to the International Space Station (ISS), with a survival rate of approximately 45%.

SIGNAL 04 | ON-ORBIT SERVICE

Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026

Shanghai Xingyi Xinneng has raised approximately 100 million yuan to commercialize flexible perovskite solar cells using colorless polyimide (CPI) encapsulation.

DECISION

Focus this week's management attention on mission evidence, launch economics, resilient supply and regulatory access. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: separate announced missions from funded, licensed, launched and operational capability.
2. Suppliers: qualify components and services against mission environment, traceability and cadence.
3. Executives: track funding, licensing, launch date, on-orbit performance, capacity and insurance.

EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

Numbers and evidence anchors that require conditions

70 km
A04

SOURCE-BOUND CONDITION
Black carbon (BC) emissions from Starship-scale fleets in the 15-70 km layer cause UV damage approximately 1,900 times greater per kilogram than CO2 over 100 years.

45%
A01

SOURCE-BOUND CONDITION
Tardigrades successfully survived two dormancy-revival cycles during a 64-day mission to the International Space Station (ISS), with a survival rate of approximately 45%.

100 million
A11

SOURCE-BOUND CONDITION
Shanghai Xingyi Xinneng has raised approximately 100 million yuan to commercialize flexible perovskite solar cells using colorless polyimide (CPI) encapsulation.

25 years
A02

SOURCE-BOUND CONDITION
Analysis of 25 years of International Space Station (ISS) operations reveals that packaging polymers create a "plastic ceiling" that limits the capacity of microbial biotechnology to recover carbon.

85%
A07

SOURCE-BOUND CONDITION
Direct measurements from the Arase satellite reveal that Earth's own ionosphere, rather than solar wind, provided approximately 85% of the ions during the May 2024 geomagnetic storm.

HOW TO USE THESE NUMBERS
Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.

1

Components

P01/P06

Acoustic analysis of three ISS crew members reveals a consistent in-flight decline in the Harmonics-to-Noise Ratio (HNR).

2

Spacecraft

P02/P07

Black carbon (BC) emissions from Starship-scale fleets in the 15-70 km layer cause UV damage approximately 1,900 times.

3

Launch

P03/P08

Tardigrades successfully survived two dormancy-revival cycles during a 64-day mission to the International Space Station.

4

On-orbit service

P04/P09

Shanghai Xingyi Xinneng has raised approximately 100 million yuan to commercialize flexible perovskite solar cells using.

5

Downstream market

P05/P10

Analysis of 25 years of International Space Station (ISS) operations reveals that packaging polymers create a " plastic.

EVIDENCE REQUIRED AT EACH HANDOFF

Components to Spacecraft	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Spacecraft to Launch	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Launch to On-orbit service	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
On-orbit service to Downstream market	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented funding, licensing, launch date, on-orbit performance, capacity and insurance.

Priority map: maturity and next decision locus



P01	ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs Business / rules | cue: acquisition
P02	Starship Fleet Emissions: UV Damage Factors and BC vs CO2 System / adoption | cue: launch
P03	Tardigrades in Space: Reversible Dormancy and ISS Revival Results Tech / process | cue: no system/business cue
P04	Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026 System / adoption | cue: commercialize
P05	Microbial Carbon Recovery: ISS Waste Limits and Recovery Capacity Business / rules | cue: Capacity
P06	Zhongke Tiansuan: Space Supercomputing Payload Specs and 2035 Roadmap System / adoption | cue: commercial
P07	May 2024 Solar Storm: Earth's Ionosphere Role in Ring Current Business / rules | cue: infrastructure
P08	SpaceX Starship Flight 15: Satellite Deployment and Recovery Timeline System / adoption | cue: Deployment
P09	GEO-KOMPSAT-5: Technical Specs and 2031 Launch Roadmap System / adoption | cue: Launch
P10	NASA Perseverance: Organic Carbon Confirmed in Martian Rocks Tech / process | cue: no system/business cue

REPRODUCIBLE POSITIONING RULE

Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01 ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs

A03 | Components | Product adoption

Prior release 2026-11-06

FACT

Acoustic analysis of three ISS crew members reveals a consistent in-flight decline in the Harmonics-to-Noise Ratio (HNR) across most vowels. The study establishes a characterized acquisition chain to ensure that physiological changes are distinguished from processing artifacts. This provides an operational model for voice-based crew health monitoring in microgravity.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P02 Starship Fleet Emissions: UV Damage Factors and BC vs CO2

A04 | Spacecraft | Research

2026-11-09

FACT

Black carbon (BC) emissions from Starship-scale fleets in the 15-70 km layer cause UV damage approximately 1,900 times greater per kilogram than CO2 over 100 years. While CO2 impacts are well-documented, the study highlights that BC-driven stratospheric heating significantly increases human health damage (DALY). This suggests that for large-scale launch fleets, BC emissions may become the dominant environmental health factor.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03 Tardigrades in Space: Reversible Dormancy and ISS Revival Results

A01 | Launch | Research

2026-11-09

FACT

Tardigrades successfully survived two dormancy-revival cycles during a 64-day mission to the International Space Station (ISS), with a survival rate of approximately 45%. The study demonstrates that multicellular animals can be transported in a dormant state and revived beyond Earth, providing a potential strategy for long-duration space missions.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P04 Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026

A11 | On-orbit service | Research

2026-11-10

FACT

Shanghai Xingyi Xinneng has raised approximately 100 million yuan to commercialize flexible perovskite solar cells using colorless polyimide (CPI) encapsulation. The technology aims to reduce satellite launch costs by 15-20% by significantly lowering the weight and volume of power systems.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05 Microbial Carbon Recovery: ISS Waste Limits and Recovery Capacity

A02 | Downstream market | Product adoption

2026-11-10

FACT

Analysis of 25 years of International Space Station (ISS) operations reveals that packaging polymers create a "plastic ceiling" that limits the capacity of microbial biotechnology to recover carbon. While 87 metric tons of carbon were delivered to low Earth orbit, the composition of waste streams restricts the effectiveness of biological carbon-loop closure.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: BUSINESS / RULES

P06 Zhongke Tiansuan: Space Supercomputing Payload Specs and 2035 Roadmap

A05 | Components | Pilot

2026-11-14

FACT

Zhongke Tiansuan has developed the "Aurora 5000C," a commercial-grade space supercomputing payload utilizing fully domestic Chinese chips. The company plans to deploy a 10EOPS space supercomputing center by 2035 to provide global computing power and support satellite internet optimization.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07 May 2024 Solar Storm: Earth's Ionosphere Role in Ring Current

A07 | Spacecraft | Research

2026-11-13

FACT

Direct measurements from the Arase satellite reveal that Earth's own ionosphere, rather than solar wind, provided approximately 85% of the ions during the May 2024 geomagnetic storm. This finding suggests that atmospheric particles significantly amplify the severity of extreme storms, posing increased risks to satellite infrastructure and power grids.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: BUSINESS / RULES

P08 SpaceX Starship Flight 15: Satellite Deployment and Recovery Timeline

A10 | Launch | Research

2026-11-14

FACT

SpaceX has initiated the 15th flight test of the Starship system, successfully deploying 26 Starlink V3 satellites into orbit. While the Super Heavy booster performed a water landing, the Starship spacecraft is currently in orbit with the goal of attempting its first-ever launch tower catch.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09 GEO-KOMPSAT-5: Technical Specs and 2031 Launch Roadmap

A09 | On-orbit service | Research

2026-11-08

FACT

South Korea is developing the GEO-KOMPSAT-5 (Cheollian Satellite 5) to double observation resolution for monitoring wildfires and typhoons. The project, led by private sector industry for the first time, aims for a Q2 2031 launch to enhance disaster response and space weather monitoring.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

P10 NASA Perseverance: Organic Carbon Confirmed in Martian Rocks

A08 | Downstream market | Research

2026-11-12

FACT

NASA's Perseverance rover has confirmed the presence of macromolecular carbon (MMC) in two ancient rocks within the Bright Angel formation of Jezero crater. The material was detected just a few microns below the surface, suggesting that organic building blocks may have been widespread across ancient Martian lakes and rivers.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 18/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW | 0-30 DAYS	NEXT | 1-12 MONTHS	LATER | 1-5 YEARS
Operating companies	separate announced missions from funded, licensed, launched and operational capability	Run production-like qualification with explicit acceptance and stop criteria.	Build a portfolio and architecture that can absorb technology and supplier changes.
Materials, equipment and technology suppliers	qualify components and services against mission environment, traceability and cadence	Create shared reliability, process-window and failure-analysis data with customers.	Standardize interfaces, traceability, lifecycle support and recovery services.
Trading, investment and legal teams	Map funding, licensing, launch date, on-orbit performance, capacity and insurance.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW | 0-30 DAYS
Evidence ledger
Owner: Strategy + quality
Deliverable: claim, source, condition, owner

NOW | 0-30 DAYS
Risk screen
Owner: Procurement + legal
Deliverable: unknowns, alternatives, stop

NEXT | 1-12 MONTHS
Joint qualification
Owner: R&D + supplier
Deliverable: process window and failure data

NEXT | 1-12 MONTHS
Commercial gate
Owner: Business + finance
Deliverable: unit economics and capacity

LATER | 1-5 YEARS
Platform strategy
Owner: Executive team
Deliverable: portfolio and interface roadmap

LATER | 1-5 YEARS
Service layer
Owner: Operations + channel
Deliverable: monitoring, maintenance and recovery

GO / NO-GO GATES

GATE	OWNER	REQUIRED EVIDENCE	NO-GO CONDITION
G1 Evidence	**Quality**	Source, test conditions and reproducibility	No traceable evidence
G2 Integration	**R&D**	Interface, process window and failure analysis	Cannot meet system conditions
G3 Commercial	**Business**	Capacity, total cost, contract and alternatives	Economics or supply cannot be supported
G4 Lifecycle	**Operations**	Monitoring, maintenance, change notice and exit	No accountable operating plan

ANALYZED ARTICLES | ITEMS 01-11

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

ID	FULL ARTICLE TITLE	FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE
A01	Tardigrades in Space: Reversible Dormancy and ISS Revival Results	https://doi.org/10.64898/2026.11.06.764766
A02	Microbial Carbon Recovery: ISS Waste Limits and Recovery Capacity	https://doi.org/10.21203/rs.3.rs-11156921/v1
A03	ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs	https://doi.org/10.21203/rs.3.rs-10884904/v1
A04	Starship Fleet Emissions: UV Damage Factors and BC vs CO2	https://doi.org/10.21203/rs.3.rs-11648857/v1
A05	Zhongke Tiansuan: Space Supercomputing Payload Specs and 2035 Roadmap	https://news.qq.com/rain/a/20261114A0420O00?id=20261114A0420O00&path=a&app=news&suid=&redirect_pc=1
A06	SMILE Satellite: Panoramic Imaging of Earth's Magnetosphere	https://finance.sina.com.cn/jjxw/2026-11-12/doc-iniynawz1137473.shtml
A07	May 2024 Solar Storm: Earth's Ionosphere Role in Ring Current	https://www.sciencedaily.com/releases/2026/11/261111005905.htm
A08	NASA Perseverance: Organic Carbon Confirmed in Martian Rocks	https://www.sciencedaily.com/releases/2026/11/261111005908.htm
A09	GEO-KOMPSAT-5: Technical Specs and 2031 Launch Roadmap	https://www.newspim.com/news/view/20261106000354
A10	SpaceX Starship Flight 15: Satellite Deployment and Recovery Timeline	https://sorae.info/space/20261114-starship-15.html
A11	Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026	https://36kr.jp/501638/

SpaceIndustry — Selected Articles

Date: 2026-11-15

Articles: 11

Table of Contents

#01 Tardigrades in Space: Reversible Dormancy and ISS Revival Results

#02 Microbial Carbon Recovery: ISS Waste Limits and Recovery Capacity

#03 ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs

#04 Starship Fleet Emissions: UV Damage Factors and BC vs CO2

#05 Zhongke Tiansuan: Space Supercomputing Payload Specs and 2035 Roadmap

#06 SMILE Satellite: Panoramic Imaging of Earth's Magnetosphere

#07 May 2024 Solar Storm: Earth's Ionosphere Role in Ring Current

#08 NASA Perseverance: Organic Carbon Confirmed in Martian Rocks

#09 GEO-KOMPSAT-5: Technical Specs and 2031 Launch Roadmap

#10 SpaceX Starship Flight 15: Satellite Deployment and Recovery Timeline

#11 Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026

#01 Tardigrades in Space: Reversible Dormancy and ISS Revival Results

Published November 09, 2026 bioRxiv



OVERVIEW

Tardigrades successfully survived two dormancy-revival cycles during a 64-day mission to the International Space Station (ISS), with a survival rate of approximately 45%. The study demonstrates that multicellular animals can be transported in a dormant state and revived beyond Earth, providing a potential strategy for long-duration space missions.

IN DEPTH

Key Findings

Approximately 45% of tardigrades survived a 64-day experimental period that included transport to the International Space Station (ISS), 18 days aboard the station, and two complete dormancy-revival cycles. Surviving organisms retained their reproductive capacity despite prolonged periods without food or water.

Technical Details

The research verified that dormant tardigrades can withstand extreme environmental stressors, including:

- Temperatures near absolute-zero (~12 mK).
- Near-vacuum conditions (10 -9 mbar).
- High doses of ionizing radiation (3000 Gy).
- Complete desiccation.

Transcriptomic analysis of the ISS-exposed tardigrades revealed specific molecular responses to the spaceflight environment. Researchers observed an upregulation of genes associated with stress responses and protein folding. Conversely, there was a downregulation of genes involved in protein synthesis and energy metabolism.

Background & Context

Long-duration space missions are hindered by limited resources and the risks associated with prolonged exposure to radiation and microgravity. Transporting organisms in a dormant state and reviving them upon arrival offers a potential solution to these logistical and biological challenges. While dormancy is known in some species, the feasibility of this strategy for multicellular animals had not been experimentally demonstrated beyond Earth until this study.

Significance & Outlook

This experiment establishes a foundation for dormancy-based strategies in future space exploration. By proving that a multicellular animal can be revived in orbit, returned to a dormant state, and revived again upon returning to Earth, the findings suggest a viable method for transporting biological organisms across deep space while minimizing resource consumption and environmental damage.

Source: https://doi.org/10.64898/2026.11.06.764766

Collected: November 15, 2026 | Automated Research System (AI)

#02 Microbial Carbon Recovery: ISS Waste Limits and Recovery Capacity

Published November 10, 2026 Research Square



OVERVIEW

Analysis of 25 years of International Space Station (ISS) operations reveals that packaging polymers create a "plastic ceiling" that limits the capacity of microbial biotechnology to recover carbon. While 87 metric tons of carbon were delivered to low Earth orbit, the composition of waste streams restricts the effectiveness of biological carbon-loop closure.

IN DEPTH

Key Findings

The primary constraint on microbial carbon recovery in crewed spaceflight is the composition of the waste stream, specifically packaging polymers. A Bio-Process Sizing Framework developed for this study demonstrates that these polymers set a "ceiling" on what biology can recover, regardless of the operational scenario.

Technical Details

The research utilizes an empirical carbon-accounting record spanning 25 years of stable ISS operations. During this period, logistics resupply transported approximately 87 metric tons of carbon to low Earth orbit. To evaluate recovery potential, the researchers employed a Bio-Process Sizing Framework that converts user-defined operational inputs into projected carbon-recovery capacities. This framework calculates required reactor volumes based on the physical constraints of aqueous bioprocess design, comparing the theoretical limits of physics against the capabilities of extant biology.

Background and Context

The International Space Station currently utilizes an open resource model. While the water cycle is substantially closed and the oxygen cycle is partially closed, the system for elemental carbon remains open. Carbon found in food, clothing, and packaging is typically disposed of via venting or atmospheric re-entry. This linear consumption model is considered incompatible with the requirements for planetary protection and the autonomy necessary for deep-space operations.

Significance and Outlook

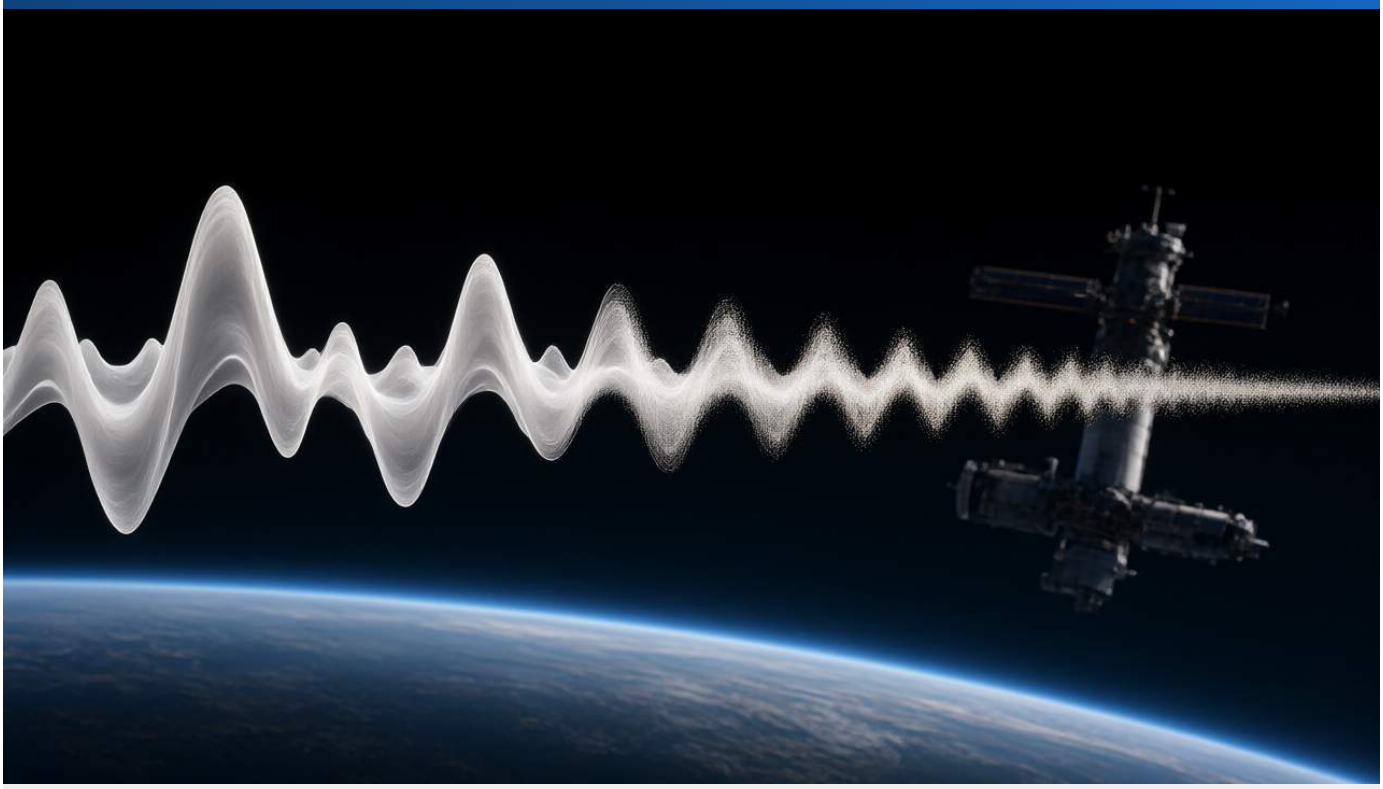
Although microbial biotechnology has been proposed as a method to achieve carbon-loop closure, this study provides a quantification of the recovery capacity of resupply-derived waste for the first time. The results indicate that the physical and biological limitations of current bioprocesses, coupled with the nature of space-grade packaging materials, present a significant barrier to achieving full carbon autonomy in crewed spaceflight.

Source: https://doi.org/10.21203/rs.3.rs-11156921/v1

Collected: November 15, 2026 | Automated Research System (AI)

#03 ISS Voice Monitoring: HNR Decline and Acoustic Chain Specs

Published November 06, 2026 Research Square



OVERVIEW

Acoustic analysis of three ISS crew members reveals a consistent in-flight decline in the Harmonics-to-Noise Ratio (HNR) across most vowels. The study establishes a characterized acquisition chain to ensure that physiological changes are distinguished from processing artifacts. This provides an operational model for voice-based crew health monitoring in microgravity.

IN DEPTH

Key Findings

The primary physiological result is a consistent decline in the Harmonics-to-Noise Ratio (HNR) during flight. For crew member M1, the HNR decreased by -1.89 dB for the vowel /a/ and -2.33 dB for /i/ when comparing pre-flight to in-flight data using the DNS64 processing version. To ensure these results were not artifacts of the recording chain, the researchers first characterized the impact of noise suppression and segmentation conventions.

Technical Details

The study evaluated the "acquisition chain" to identify which measures are perturbed by processing. Key technical observations include:

- **Noise-Suppression Sensitivity:** Noise suppression strongly affects measures defined against a noise floor. In 63 matched cells, HNR increased by a median of +3.56 dB and Shimmer decreased by -3.35% after noise suppression. Conversely, F_0 (median shift +0.19 Hz) and CPPS ($p = 0.94$) remained essentially unmoved.
- **Segmentation Impact:** The method of segmenting cough recordings significantly alters results. Using a "whole-recording" convention instead of "burst-level" inflated rise time by an order of magnitude (108.9 ms vs 11.0 ms) because 90.9% of recordings were silence.
- **Chain-Invariant Observables:** Two types of data were found to be stable: periodicity-based measures (F_0 and CPPS) and dimensionless ratios (e.g., HNR(/a/) ÷ HNR(/i/)). The within-crew dispersion of this ratio was 11.3–15.0%, comparable to a sound-treated clinical corpus.

Background and Context

The research emphasizes that an acoustic measurement is only interpretable if the acquisition chain is understood. By computing the phase contrast entirely within the DNS64 version, the processing term is identical on both sides of the comparison and cancels out, allowing for a valid interpretation of the physiological shift.

Significance and Outlook

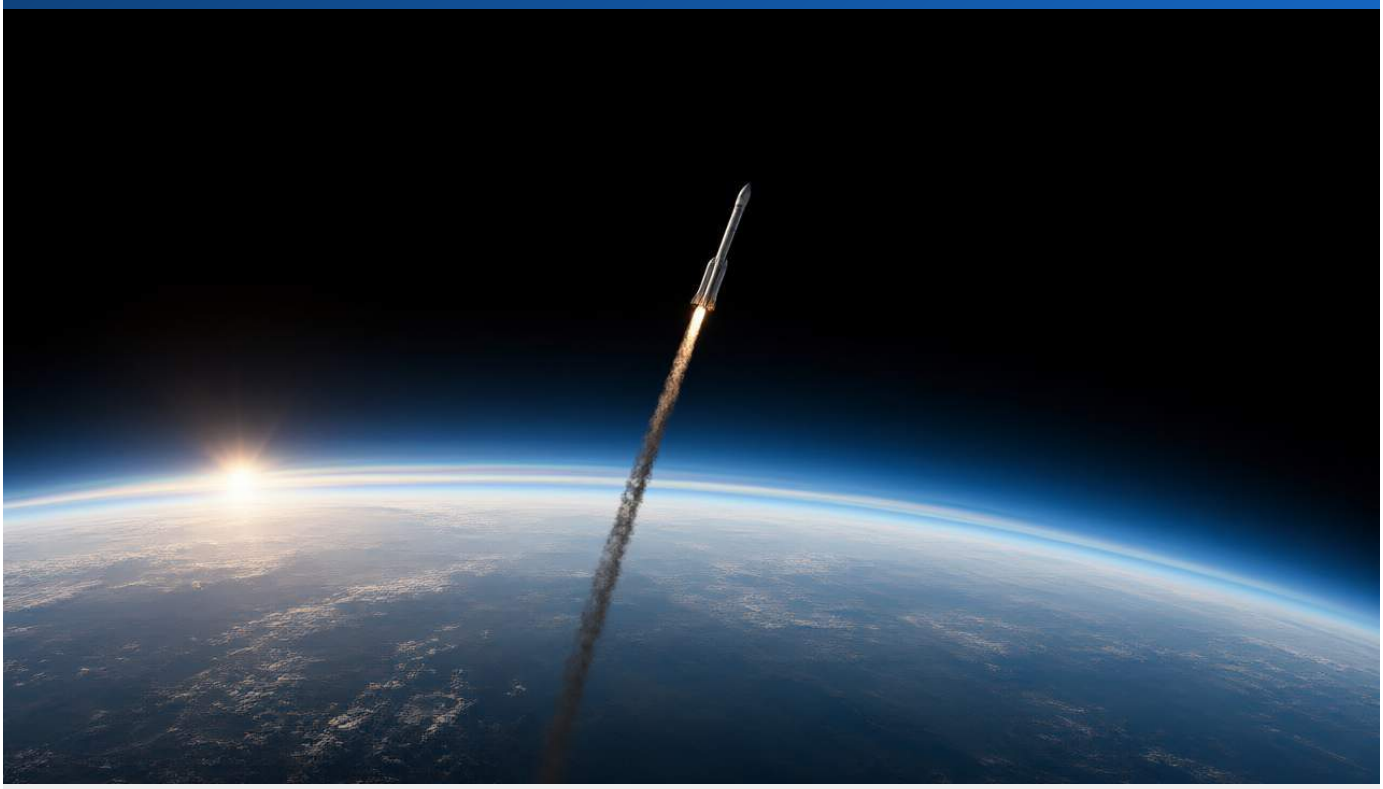
The findings indicate that flight implementations must fix segmentation conventions as part of the instrument specification, as these conventions contribute more to reported cough timing than plausible physiological effects. This framework enables the use of voice-based monitoring as a reliable tool for tracking crew health in space.

Source: https://doi.org/10.21203/rs.3.rs-10884904/v1

Collected: November 15, 2026 | Automated Research System (AI)

#04 Starship Fleet Emissions: UV Damage Factors and BC vs CO2

Published November 09, 2026 Research Square



OVERVIEW

Black carbon (BC) emissions from Starship-scale fleets in the 15–70 km layer cause UV damage approximately 1,900 times greater per kilogram than CO2 over 100 years. While CO2 impacts are well-documented, the study highlights that BC-driven stratospheric heating significantly increases human health damage (DALY). This suggests that for large-scale launch fleets, BC emissions may become the dominant environmental health factor.

IN DEPTH

Key Findings

The primary driver of human health damage from Starship launches is black carbon (BC) emitted in the 15–70 km altitude range. Per kilogram, the UV damage from BC is about 1,900 times that of CO2 over a 100-year period. For a single Starship launch, UV damage is estimated at 11 DALY (Disability-Adjusted Life Years) at 5 g/kg and 48 DALY at 22 g/kg, compared to 3.7 DALY for its combustion CO2 over 100 years.

Technical Details

The research identifies three main species affecting ozone: BC, Cly, and NOx. While Cly and NOx destroy ozone through catalytic cycles, BC acts indirectly by heating the stratosphere, which alters circulation and chemistry. The human health damage factors (P50) are as follows:

- **BC (15–70 km):** 2.9×10^{-3} DALY/kg
- **Cly (15–50 km):** 2.4×10^{-4} DALY/kg
- **NOx (≥ 15 km):** 3.5×10^{-5} DALY/kg

The study notes a surface-ozone co-benefit that offsets approximately 75% of BC UV damage and all of Cly UV damage, though the net ozone damage remains a non-robust figure due to wide variance in concentration-response functions.

Vehicle Comparisons

When measured per tonne of payload capacity, the impact depends on the methane-engine BC concentration. At 5 g/kg, Falcon 9 causes 2.1–3.1 times the UV damage of Starship. However, at 22 g/kg, Starship causes 1.4–2.1 times the damage of Falcon 9, with parity occurring between 11–15 g/kg.

Significance and Outlook

For current launch volumes, such as the 145 launches per year covered by environmental reviews, BC levels remain below simulated doses. However, large fleets will reach these doses, potentially leading to significant UV-related health impacts. The study recommends using separate indicators for UV damage and surface-ozone co-benefits rather than a single net value to ensure accurate life cycle assessments for future fleet scales.

Source: https://doi.org/10.21203/rs.3.rs-11648857/v1

Collected: November 15, 2026 | Automated Research System (AI)

#05 Zhongke Tiansuan: Space Supercomputing Payload Specs and 2035 Roadmap

Published November 14, 2026　腾讯新闻（上观新闻）　China



OVERVIEW

Zhongke Tiansuan has developed the "Aurora 5000C," a commercial-grade space supercomputing payload utilizing fully domestic Chinese chips. The company plans to deploy a 10EOPS space supercomputing center by 2035 to provide global computing power and support satellite internet optimization.

IN DEPTH

Key Findings

Zhongke Tiansuan has successfully developed the "Aurora 5000C," a business-grade space supercomputing payload. Unlike previous experimental satellites, this payload is designed for commercial operationality, meaning it can provide continuous, deliverable, and reusable on-orbit computing services. The system is based on fully domestic Chinese chips and is awaiting launch for on-orbit verification.

Technical Details

The Aurora 5000C is a cluster-level system reaching POPS-scale computing power. It integrates four types of domestic chips: CPU, GPU, NPU, and FPGA, utilizing heterogeneous integration technology to ensure compatibility between different brands and types. To address the vacuum of space, the team developed a specialized cooling system to export heat from the chips. To mitigate radiation-induced errors, the company employs a fault-tolerant computing scheme combining "spatial redundancy, time redundancy, and information redundancy."

The company's technical evolution includes previous iterations:

- **Aurora 1000A:** An edge-integrated machine with 32 TOPS computing power and 1TB to 2TB storage. It has operated on-orbit for over 1,200 days and has demonstrated on-orbit injection and real-time inference of large models.
- **Aurora 3000B:** A distributed general-purpose computer with 0.5 POPS computing power and 8TB storage, used to verify scalable intelligent module schemes.

Background and Context

Based in the Space-based Computing Industry Base in Songjiang, Shanghai, Zhongke Tiansuan is integrating with the "Thousand Sails Constellation" (GigaConstellation) project. By deploying Aurora edge machines on communication satellites, the company aims to provide the computing power necessary for the dynamic network optimization of large-scale low-earth orbit (LEO) satellite constellations.

Significance and Outlook

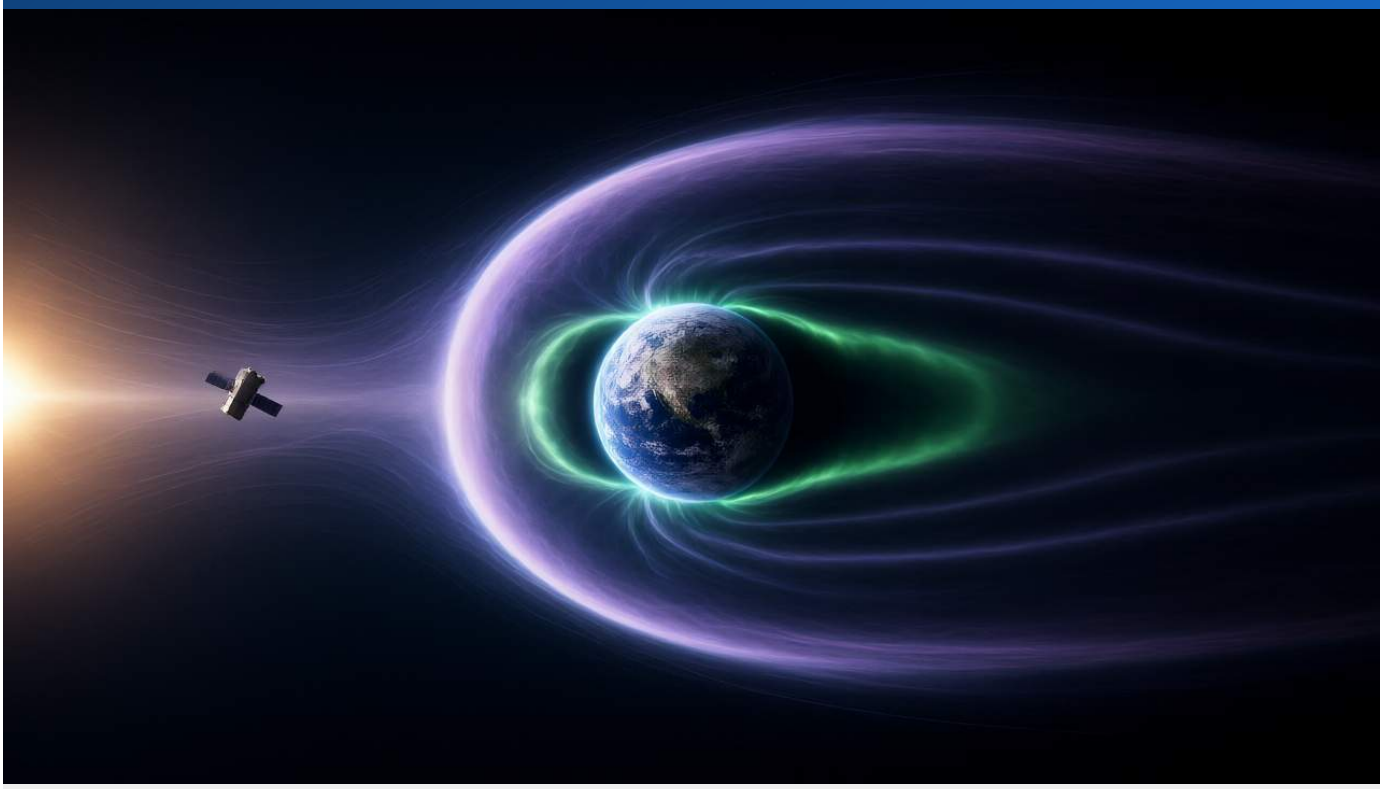
Under the "Tiansuan Plan," the company intends to deploy a ten-thousand-card space supercomputing center by 2035 in a sun-synchronous orbit. This center will consist of a computing cabin (target 10EOPS), an energy cabin (over 100MW via flexible photovoltaics), a communication cabin (bandwidth over 10Tbps), and an automated maintenance cabin. The goal is to provide "computing power equity" and AI accessibility to "Belt and Road" partner nations.

Source: https://news.qq.com/rain/a/20261114A0420O00?id=20261114A0420O00&path=a&app=news&suid=&redirect_pc=1

Collected: November 15, 2026 | Automated Research System (AI)

#06 SMILE Satellite: Panoramic Imaging of Earth's Magnetosphere

Published November 12, 2026　新浪财经（光明日报）　China



OVERVIEW

The SMILE satellite, a joint project between the Chinese Academy of Sciences and the European Space Agency, has released its first observation images and detection data. By shifting from point-based measurements to panoramic imaging, the mission provides a comprehensive view of the interaction between solar wind and Earth's magnetosphere to improve space weather forecasting.

IN DEPTH

Key Findings

The SMILE (Solar wind Magnetosphere Ionosphere Link Explorer) satellite has successfully captured the first set of panoramic observation images and detection data of the Earth's magnetosphere. Unlike previous missions that relied on "in-situ" point measurements, SMILE provides a dynamic, wide-angle view of how solar wind impacts the Earth's magnetic shield and how the magnetosphere responds.

Technical Details

SMILE operates on a large elliptical orbit to observe the Earth's space environment from a distance. The satellite utilizes three primary instrument types to create a complete physical picture:

- **Soft X-ray Imager:** Captures the "outer defense line" by detecting soft X-ray photons emitted during charge exchange, where high-valence heavy ions in the solar wind capture electrons from neutral atoms in Earth's exosphere.
- **Ultraviolet Auroral Imager:** Monitors the morphology, brightness, and position of ultraviolet auroras in the North Pole region to track energy injection into the ionosphere.
- **In-situ Sensors:** Includes a solar wind ion analyzer and a magnetometer to provide the physical coordinates and background parameters necessary to interpret the imaging data.

Background and Context

The Earth's magnetosphere protects the atmosphere and human infrastructure from high-energy charged particles in the solar wind. Solar activity, such as flares and coronal mass ejections, can compress the magnetosphere and trigger magnetic storms, affecting satellite orbits, communication, navigation, and power grids in high-latitude regions. Previously, scientists relied on a few satellites acting as "fixed camera positions," which limited their ability to see the full scale of these interactions.

Significance and Outlook

By establishing a causal chain between solar wind input, magnetosphere boundary changes, and ionospheric coupling, SMILE aims to refine space weather models. This capability is critical for the safety of modern technical infrastructure, including communication satellites, manned spacecraft, and space stations, by improving early warning systems for space weather events.

Source: https://finance.sina.com.cn/jjxw/2026-11-12/doc-iniynawz1137473.shtml

Collected: November 15, 2026 | Automated Research System (AI)

#07 May 2024 Solar Storm: Earth's Ionosphere Role in Ring Current

Published November 13, 2026　ScienceDaily（Nagoya University）　Japan



OVERVIEW

Direct measurements from the Arase satellite reveal that Earth's own ionosphere, rather than solar wind, provided approximately 85% of the ions during the May 2024 geomagnetic storm. This finding suggests that atmospheric particles significantly amplify the severity of extreme storms, posing increased risks to satellite infrastructure and power grids.

IN DEPTH

Key Findings

Data from the May 2024 "Gannon storm" (or "Mother's Day storm") indicates that Earth's atmosphere plays a more dominant role in extreme geomagnetic disturbances than previously recognized. While scientists expected dense solar wind to be a primary contributor, direct measurements showed that particles from Earth's ionosphere dominated the ring current composition to an unprecedented extent, contributing approximately 85% of the ions.

Technical Details

The storm was triggered by a series of powerful solar eruptions from a large sunspot. The resulting magnetic disturbance pushed the SYM-H index to a minimum of −518 nanotesla, the second-largest recorded disturbance since 1981. Using the Arase satellite, researchers measured the mass and energy of individual ions within the ring current—a belt of charged particles circulating thousands of kilometers above the equator.

The study found that because ions from Earth's atmosphere are much heavier than those from solar wind, they strengthened the magnetic disturbance. Specifically, Arase detected a 40% decrease in magnetic field intensity at approximately 16,000 kilometers above Earth, a region much closer to the planet than previously documented for similar reductions.

Background & Context

The ring current generates a magnetic field that opposes Earth's natural field, weakening the intensity measured at ground level. The Arase satellite, launched in 2016 and operated by JAXA and Nagoya University, provided the first simultaneous observation of ring current ions and solar wind during an event of this magnitude.

Significance & Outlook

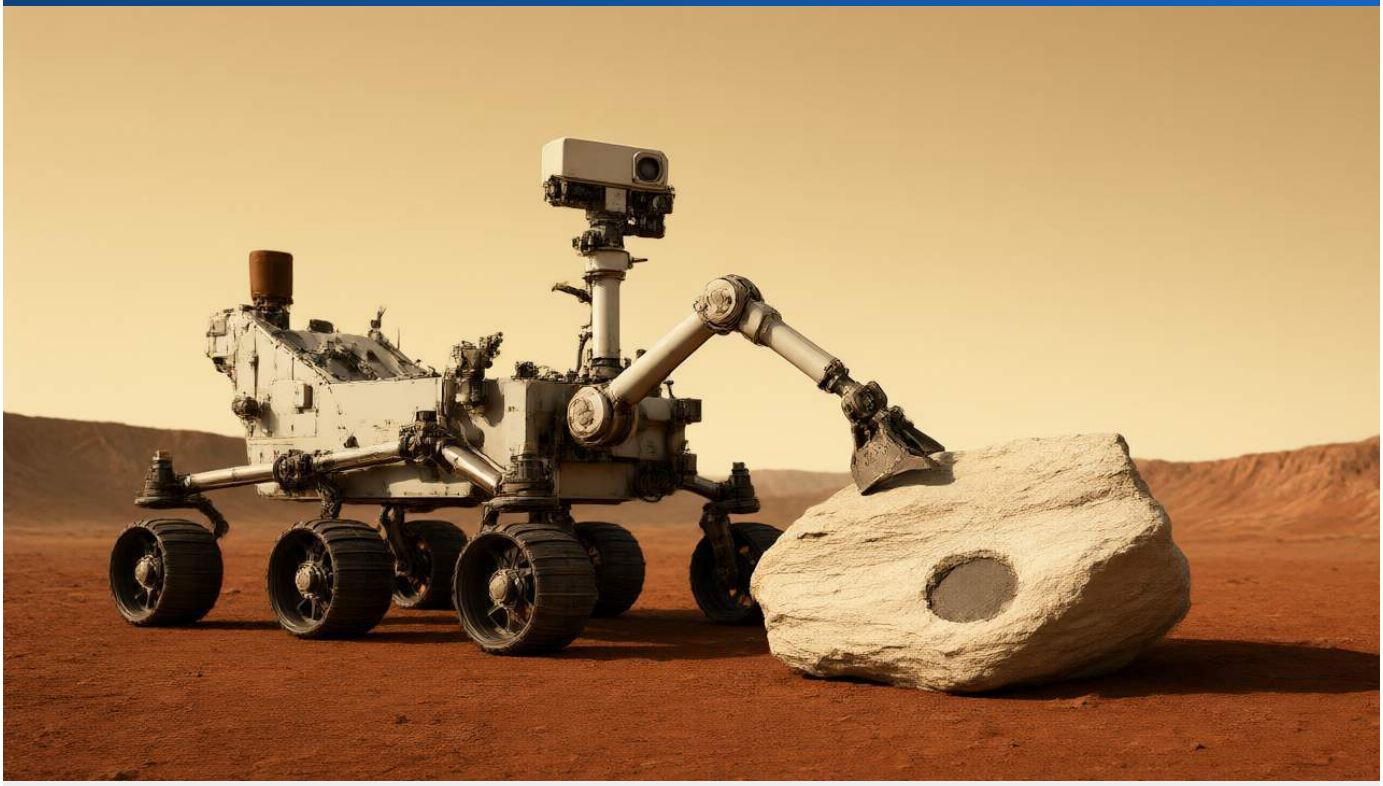
Understanding the composition of the ring current is critical because extreme geomagnetic storms create radiation risks for spacecraft, disrupt GPS signals and communications, and cause power outages. These findings support the case for a proposed Japanese satellite mission to further investigate how atmospheric particles enter space and influence the intensity of powerful geomagnetic storms.

Source: https://www.sciencedaily.com/releases/2026/11/261111005905.htm

Collected: November 15, 2026 | Automated Research System (AI)

#08 NASA Perseverance: Organic Carbon Confirmed in Martian Rocks

Published November 12, 2026 ScienceDaily（Science Advances） USA



OVERVIEW

NASA's Perseverance rover has confirmed the presence of macromolecular carbon (MMC) in two ancient rocks within the Bright Angel formation of Jezero crater. The material was detected just a few microns below the surface, suggesting that organic building blocks may have been widespread across ancient Martian lakes and rivers.

IN DEPTH

Key Findings

NASA's Perseverance rover has confirmed the presence of organic carbon in two ancient Martian rocks located in the Bright Angel formation. This discovery follows a September 2025 announcement regarding a potential biosignature. Notably, the organic carbon was detected at a depth of only a few microns below the surface—a distance smaller than the thickness of a sheet of paper—marking the shallowest detection of macromolecular carbon reported on Mars to date.

Technical Details

Researchers utilized the Scanning Habitable Environments with Raman & Luminescence for Organics & Chemicals (SHERLOC) instrument, mounted on the rover's robotic arm, to analyze the samples. The instrument employs Raman spectroscopy, using laser light to map minerals and organic compounds without damaging the rock. The analysis identified macromolecular carbon (MMC), which consists of large, interconnected networks of carbon atoms. The MMC was found within ancient sediments alongside sulfate and carbonate minerals, suggesting organic material may have entered or formed within the rocks during at least two separate geological periods.

Background and Context

The Bright Angel formation consists of mudstones created billions of years ago when sediment settled at the bottom of a river channel flowing into Jezero crater. The survival of MMC so close to the surface is unusual, as Martian radiation, sunlight, and chemical oxidants typically destroy organic molecules. Researchers suggest the material survived either due to its own chemical durability or because it was shielded by iron-rich soil or minerals such as clays.

Significance and Outlook

The discovery indicates that organic carbon was not isolated to a single region; the Bright Angel sample was collected more than 2,000 miles from Gale Crater, where the Curiosity rover previously detected organic compounds. While MMC can be produced through non-biological chemical processes and does not definitively prove past life, its widespread presence suggests that the chemical ingredients for life were common across the Martian landscape. Determining if these rocks contain fossilized microorganisms remains beyond the current capabilities of the rovers.

Source: https://www.sciencedaily.com/releases/2026/11/261111005908.htm

Collected: November 15, 2026 | Automated Research System (AI)

#09 GEO-KOMPSAT-5: Technical Specs and 2031 Launch Roadmap

Published November 08, 2026 뉴스핌 South Korea



OVERVIEW

South Korea is developing the GEO-KOMPSAT-5 (Cheollian Satellite 5) to double observation resolution for monitoring wildfires and typhoons. The project, led by private sector industry for the first time, aims for a Q2 2031 launch to enhance disaster response and space weather monitoring.

IN DEPTH

Key Findings

The Korea Meteorological Administration (KMA) has detailed the development plan for GEO-KOMPSAT-5, a next-generation geostationary meteorological satellite. The project represents a shift in procurement, as it is the first geostationary satellite in South Korea to be led by a private company, LIG D&A, rather than the Korea Aerospace Research Institute (KARI). The total project budget is 666.8 billion KRW, with the KMA contributing 543.4 billion KRW and the Korea AeroSpace Administration contributing 123.4 billion KRW.

Technical Details

GEO-KOMPSAT-5 will significantly improve observation resolution and sensor capabilities compared to the current GEO-KOMPSAT-2A:

- **Observation Channels:** Increased from 16 to 18 channels.
- **Spatial Resolution:** Visible imagery resolution improves from 0.5km to 0.25km; infrared imagery improves from 2km to 1km.
- **Water Vapor Monitoring:** Enhanced capabilities for observing lower-layer water vapor to improve predictions of heavy rainfall.
- **Space Weather:** Sensors will increase from 3 to 4, utilizing a magnetometer, satellite charging monitor, electron meter, and proton meter to support aviation safety and mitigate satellite interference.

Background & Context

The development period spans from April 2025 to December 2031. LIG D&A is responsible for the satellite system, bus, and meteorological payload, while KAIST is developing the space weather payload. KARI is managing technology transfer and the development of control and pre-processing systems. The project is currently in the preliminary design phase, with detailed design scheduled for next year, payload production in 2028, and final assembly and environmental testing in 2029 and 2030.

Significance & Outlook

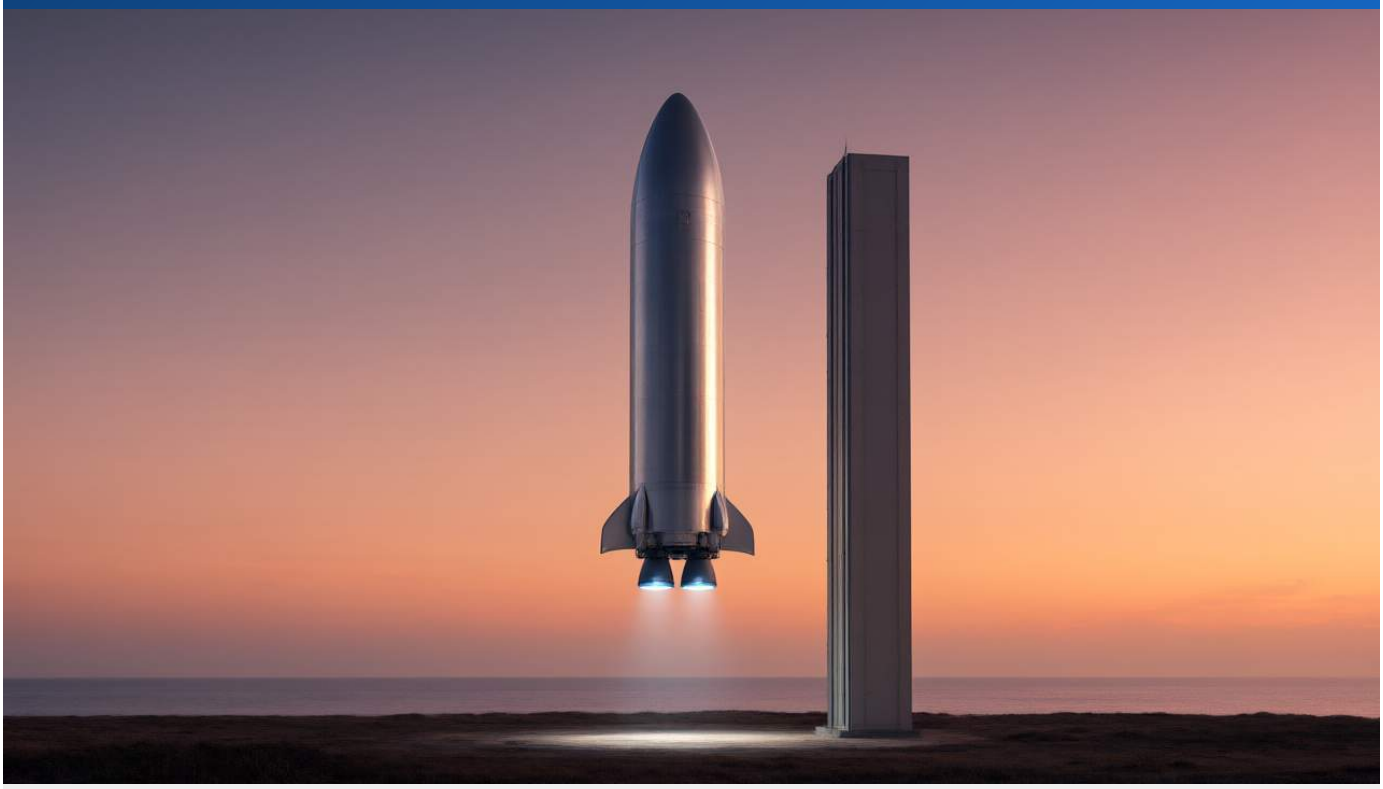
To ensure continuity, the KMA plans to extend the operation of GEO-KOMPSAT-2A until late 2031 or 2032. Additionally, a ground station system will be developed between 2027 and 2031 at a cost of approximately 45.5 billion KRW, reusing existing antennas but replacing receivers to match the new frequency. These upgrades are intended to address the increasing unpredictability of weather patterns caused by climate change.

Source: https://www.newspim.com/news/view/20261106000354

Collected: November 15, 2026 | Automated Research System (AI)

#10 SpaceX Starship Flight 15: Satellite Deployment and Recovery Timeline

Published November 14, 2026 sorae Japan



OVERVIEW

SpaceX has initiated the 15th flight test of the Starship system, successfully deploying 26 Starlink V3 satellites into orbit. While the Super Heavy booster performed a water landing, the Starship spacecraft is currently in orbit with the goal of attempting its first-ever launch tower catch.

IN DEPTH

Key Findings

On November 14, 2026 (JST), SpaceX launched the 15th flight test of the Starship system from Starbase, Texas. The mission successfully achieved orbital insertion and the deployment of 26 third-generation "Starlink V3" satellites. While the Super Heavy booster failed to return to the launch tower, the Starship spacecraft remains in orbit, targeting a return and catch attempt on November 15.

Technical Details

The vehicle lifted off at 7:47 JST on November 14. The separation of the Super Heavy booster and the Starship spacecraft occurred approximately 2 minutes and 30 seconds after liftoff. The Super Heavy booster performed a boost-back burn but did not undergo a tower catch; it splashed down in the Gulf of Mexico approximately 6 minutes and 37 seconds after liftoff.

The Starship spacecraft reached a suborbital trajectory and shut down its engines approximately 8 minutes and 9 seconds after liftoff. It later ignited one of its six engines approximately 26 minutes and 6 seconds into the flight, successfully reaching Earth orbit for the second time since the 14th flight test in September 2026. The deployment of the 26 Starlink V3 satellites began approximately 35 minutes after liftoff and lasted for about 40 minutes.

Background and Context

SpaceX intended to return both the booster and the spacecraft to the launch tower. However, the booster's return to the tower has not been executed since the 8th flight test in March 2025. As of 9:20 JST on November 14, SpaceX reported that all systems on the Starship spacecraft are functioning normally.

Significance and Outlook

The mission's primary remaining objective is the first-ever catch of the Starship spacecraft by the launch tower arms. Due to the requirements for optimal atmospheric reentry timing, the total flight duration is expected to exceed 22 hours. If the mission proceeds as planned, the catch attempt is scheduled for approximately 6:20 JST on November 15.

Source: https://sorae.info/space/20261114-starship-15.html

Collected: November 15, 2026 | Automated Research System (AI)

#11 Shanghai Xingyi Xinneng: Perovskite Solar Cell Space Roadmap 2026

Published November 10, 2026 36Kr Japan China



OVERVIEW

Shanghai Xingyi Xinneng has raised approximately 100 million yuan to commercialize flexible perovskite solar cells using colorless polyimide (CPI) encapsulation. The technology aims to reduce satellite launch costs by 15–20% by significantly lowering the weight and volume of power systems.

IN DEPTH

Key Findings

Shanghai Xingyi Xinneng (Xingyi) has secured approximately 100 million yuan in Pre-Series A funding from investors including Hainan Junda New Energy Technology and Shanghai Future Industry Fund. The company is developing a flexible solar power system combining perovskite solar cells with a proprietary colorless polyimide (CPI) encapsulation material to replace traditional rigid glass covers.

Technical Details

The system addresses the weight limitations of conventional rigid solar cells, which typically weigh 20–30kg per 1kW of power generation. Xingyi's flexible panels offer the following technical advantages:

- **Volume Reduction:** Storage volume is reduced by over 60% compared to rigid panels of the same generation area.
- **Weight Reduction:** The proprietary CPI encapsulation reduces the weight per unit of output by 40–55% compared to glass.
- **Environmental Durability:** Simulation data indicates that the cells maintain over 90% of initial conversion efficiency after 4,000 thermal shock cycles between -120 and +120 degrees Celsius.
- **Versatility:** The CPI material is compatible with both perovskite and crystalline silicon solar cells.

Background & Context

Founded in January 2026, Xingyi's core team consists of members from the Shanghai Institute of Optics and Fine Mechanics of the Chinese Academy of Sciences. The company is executing a phased orbital verification strategy:

- **May 2026:** The "Tianyan 27 Star" mission verified CPI film durability over approximately three months.
- **Next Phase:** Testing on the "B300" spacecraft by AZSPACE to confirm the protection effects of CPI on the perovskite light-absorbing layer.

- **Year-end Goal:** Orbital demonstration of a fully integrated flexible solar cell and panel system.

Significance & Outlook

The adoption of this technology in low-earth orbit (LEO) satellites is estimated to reduce overall launch costs per satellite by 15–20%. To accelerate commercialization, Xingyi has established a joint venture, Jietai Aerospace, with Hainan Junda New Energy Technology. The company intends to target commercial satellite manufacturers and platform providers, with plans for expansion into overseas markets.

Source: https://36kr.jp/501638/

Collected: November 15, 2026 | Automated Research System (AI)