AOMSUC-15 2025 FYSUC

THE 15TH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE (AOMSUC-15)

2025 FENGYUN SATELLITE USER CONFERENCE (2025 FYSUC)

TOPIC:SPACE WEATHER PREDITION AND MONITORING

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Space Weather Prediction and Monitoring

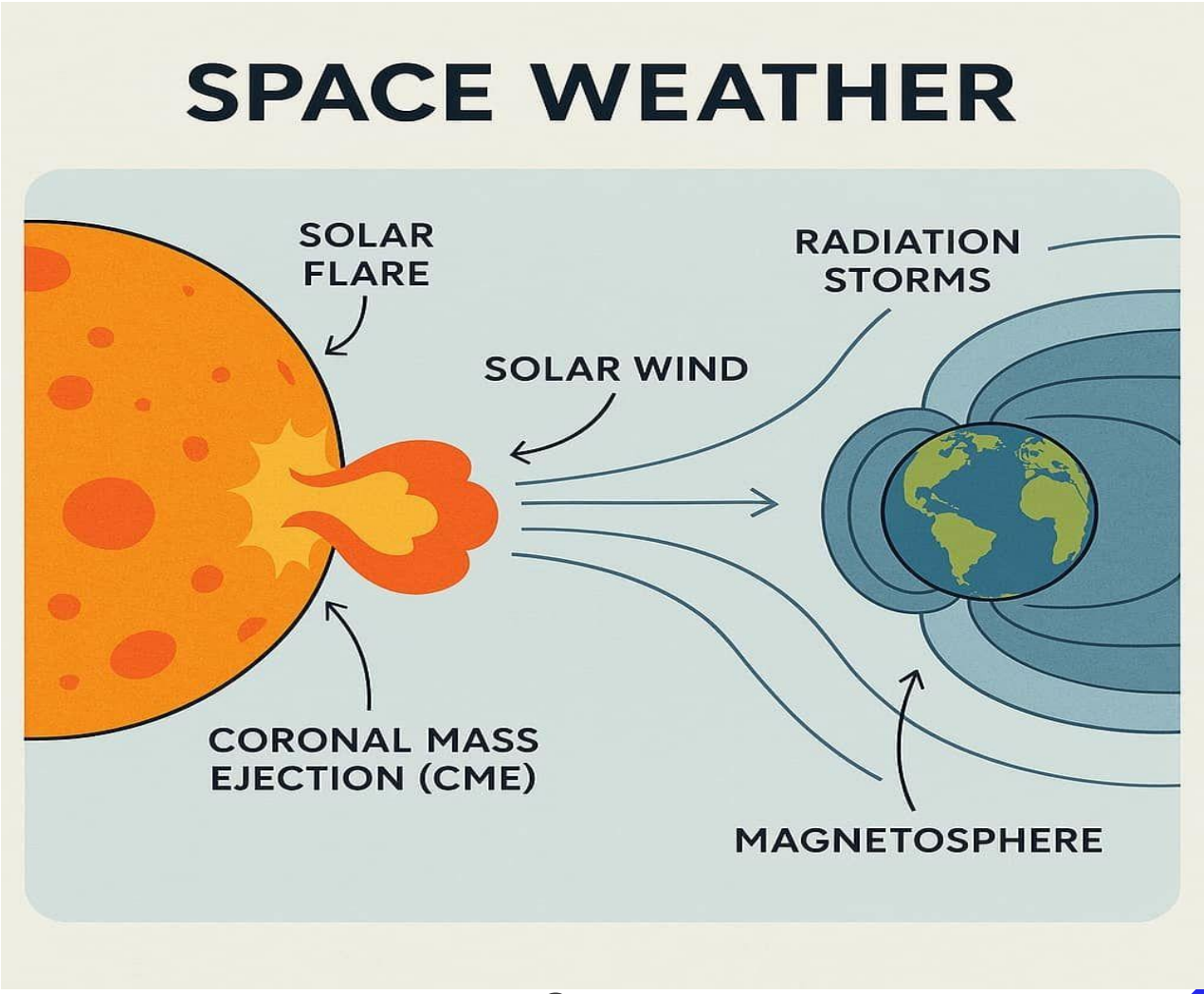
An overview of space weather phenomena, prediction models, monitoring systems, applications, challenges and future directions.

INTRODUCTION

Space weather refers to conditions in Earth's outer space environment influenced by solar activity. It affects satellites, communication, navigation, power grids, and space missions.

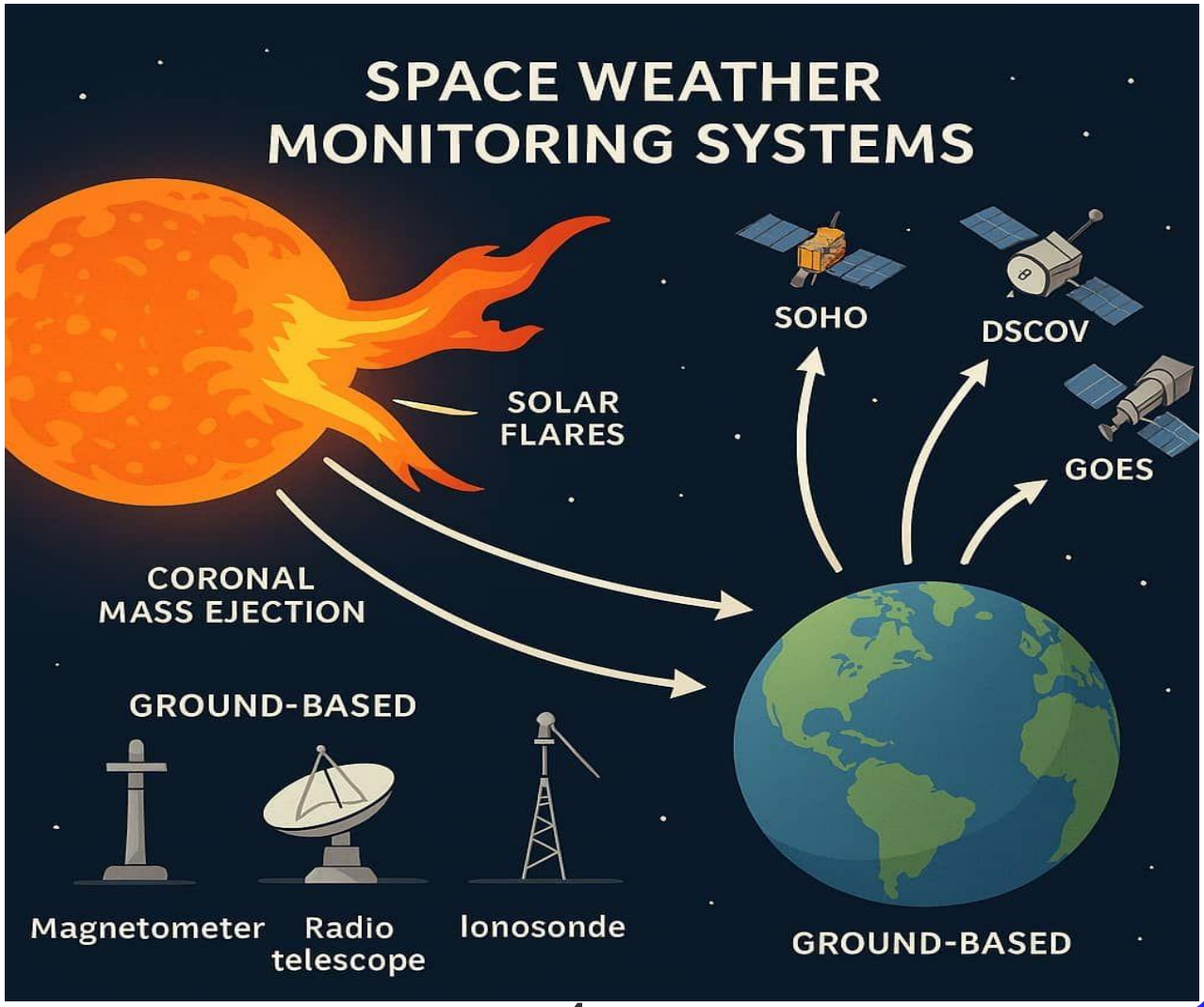
Components of Space Weather

- Solar Flares: Disrupt radio communications
- Coronal Mass Ejections (CMEs): Affect Earth's magnetosphere
- Solar Wind: Influences geomagnetic conditions
- Geomagnetic Storms: Induce currents in power lines
- Radiation Storms: Pose risks to astronauts and flights



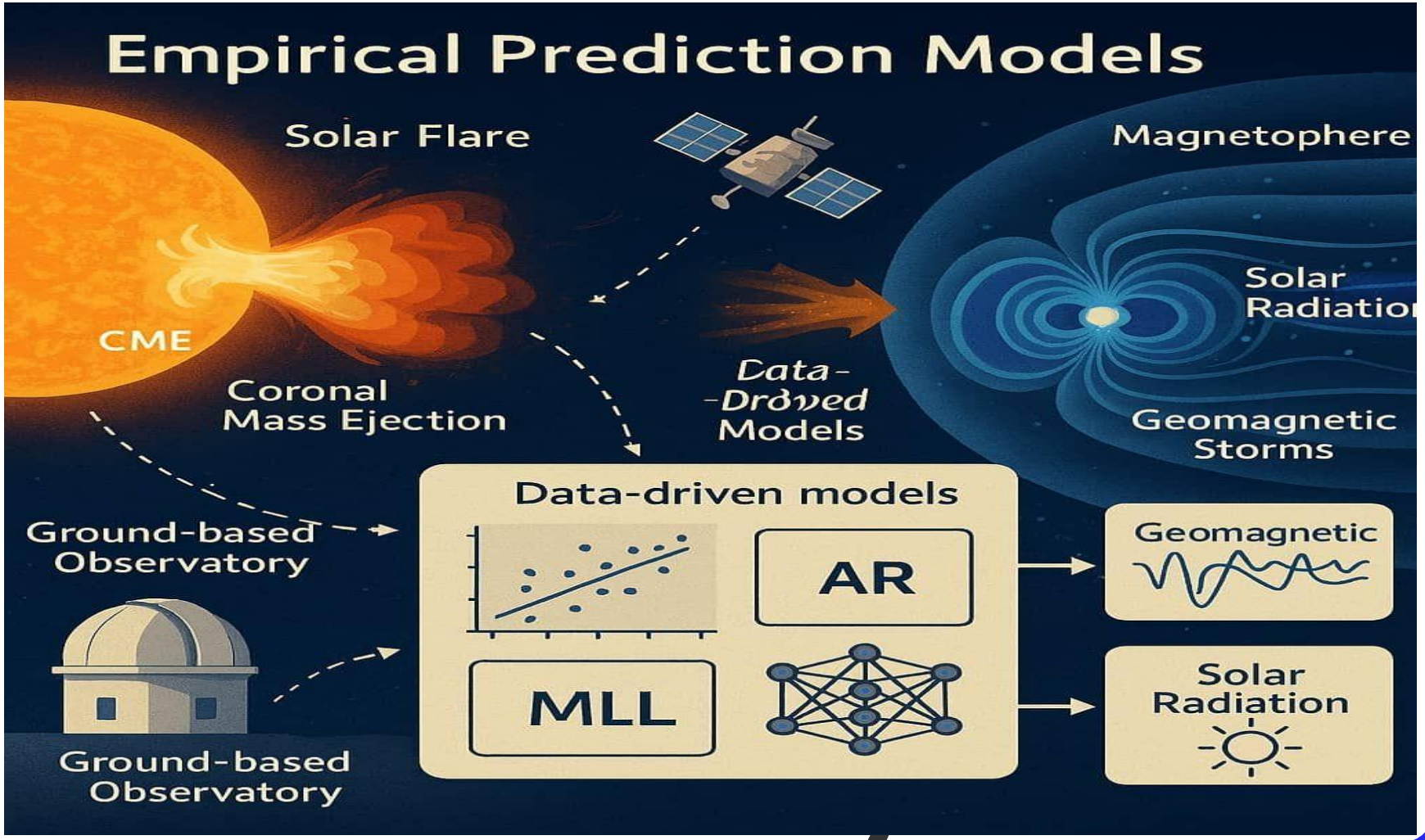
Monitoring Systems

- Ground-Based: Magnetometers, Radio Telescopes, Ionosondes
- Space-Based: Satellites like SOHO, ACE, DSCOVR
- Real-time data from GOES and other observatories



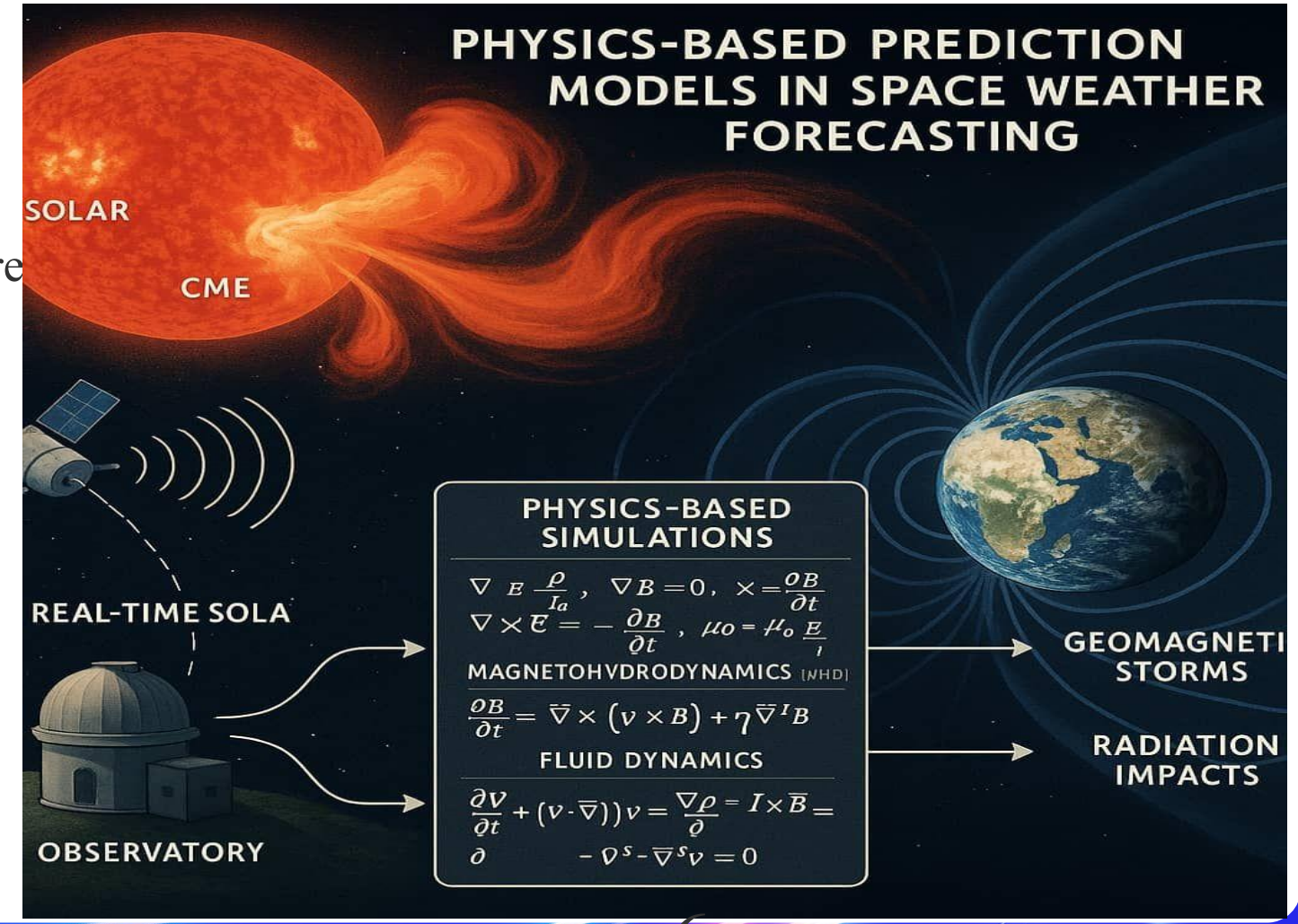
Prediction Models: Empirical

- Based on historical data
- Dst and Kp Index Models
- NOAA Solar Flare Forecasts



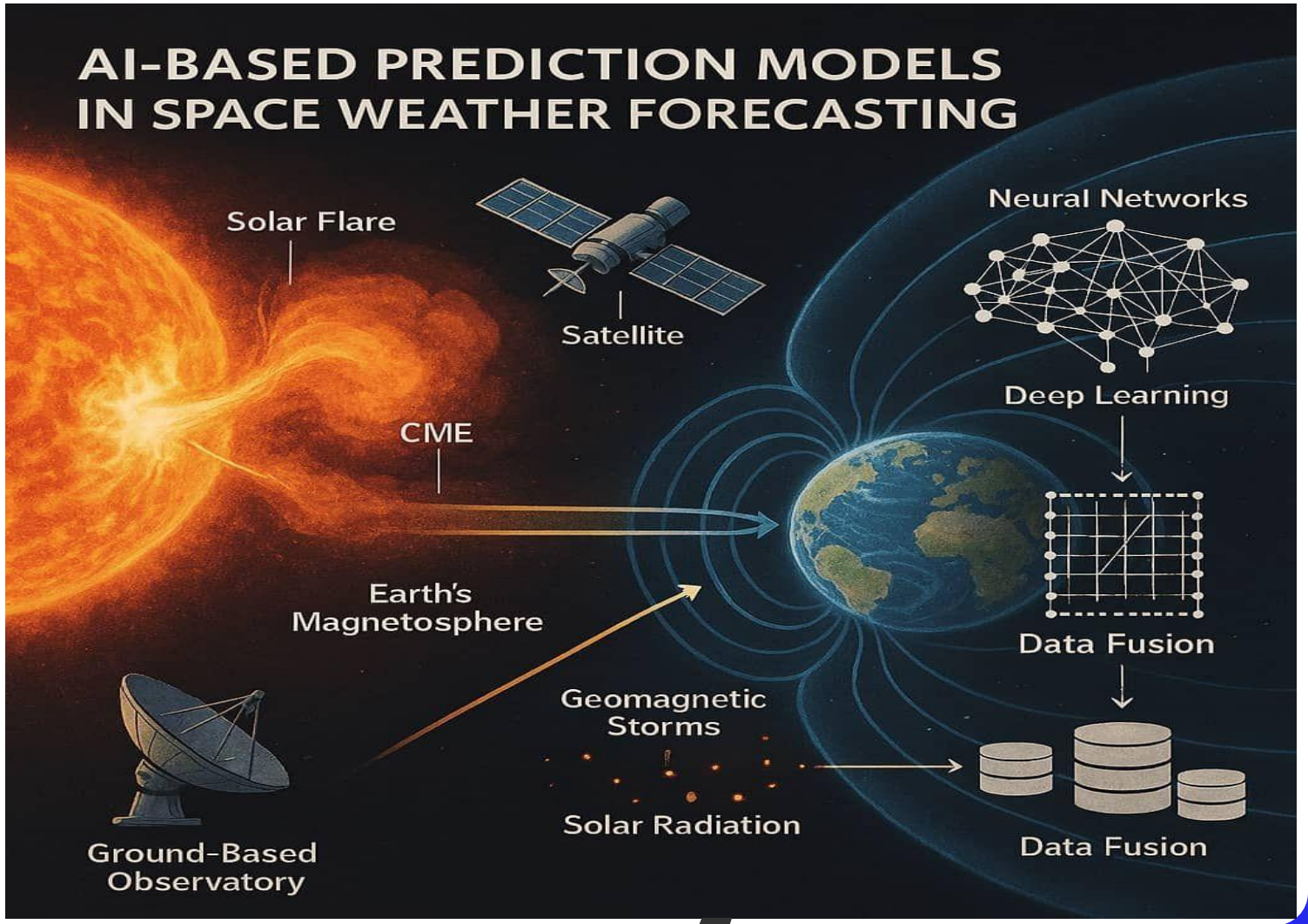
Prediction Models: Physics-Based

- Simulate solar-terrestrial dynamics
- WSA-Enlil Model for CME propagation
- GUMICS and TIE-GCM for magnetosphere and ionosphere



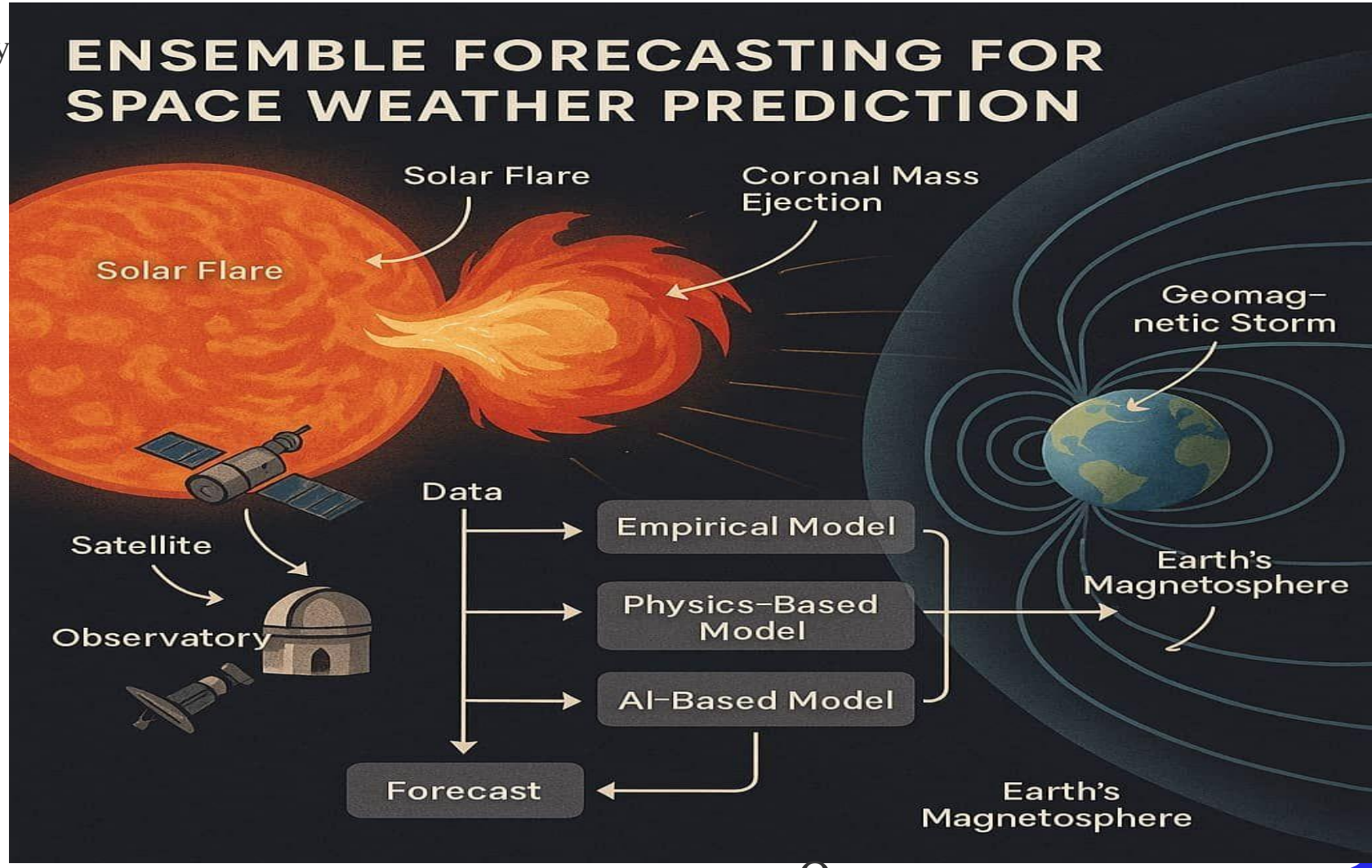
Prediction Models: AI-Based

- Deep Learning for solar flare prediction
- Random Forest and SVM for geomagnetic storms
- Hybrid models combining physics and AI



Prediction Models: Ensemble Forecasting

- Combines multiple models for reliability
- SWPC Ensemble CME Forecasts
- ISES global ensemble approaches



Applications

- Aviation safety
- Satellite protection
- Power grid stability
- GPS accuracy
- Space mission safety

Challenges

- Complex solar-terrestrial interactions
- Limited deep space data
- Need for real-time model refinement

Future Directions

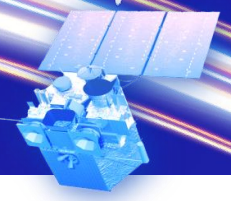
- Advanced satellites and sensors
- AI and big data integration
- Global collaboration
- Early warning systems

Conclusion

Space weather can disrupt critical systems on earth and in space.

Monitoring and Prediction-using ground and space-base tools, along with advanced models-are essential to reduce risk.

Continued innovation, global cooperation and AI integration will improve forecasting and help protection technology and human activities.



THANK YOU FOR YOUR ATTENTIONS

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