

Status of SMILES Project in JAXA

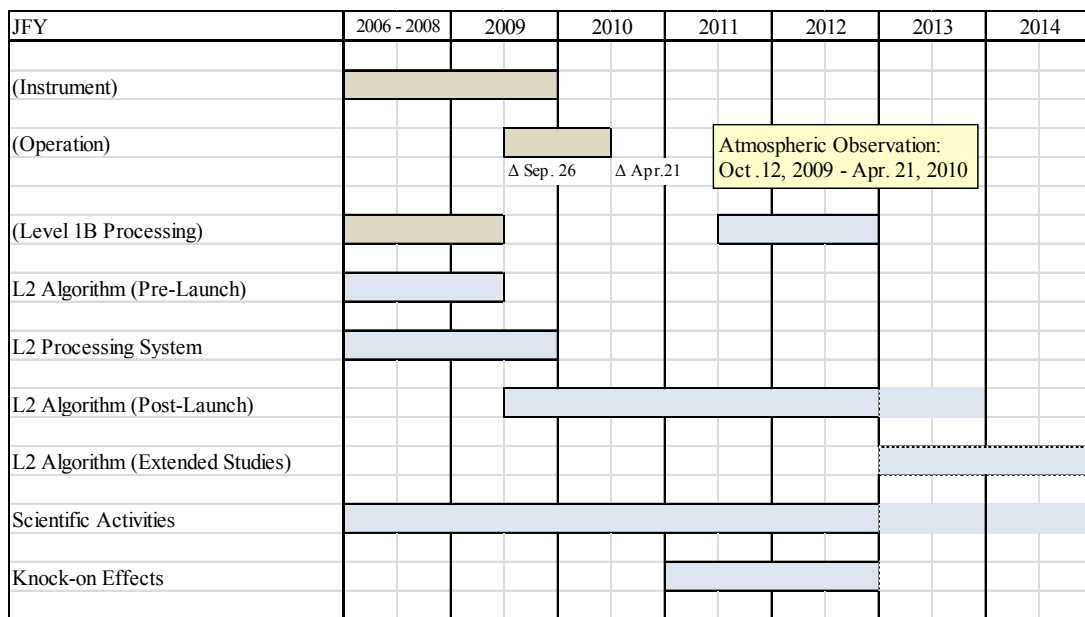
Schedule, resources and implementation

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Schedule of SMILES Project



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Development of SMILES Data Processing System (DPS)

- Development of early version was completed in the spring of 2009 (before SMILES launch).
- Processing speed: comparable with real-time observation (ex. 1 min for 1 scan (53 sec.)).
- Early version of retrieval algorithm results in “qualitatively-correct” profiles.

(Self-rating)

- DPS team, computer resources, budget, ... were sufficient.

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Operation of SMILES DPS

- L1B Operation:
 - Not designed for reprocessing (only for real-time processing)
 - Offline L0 data transfer (in the same operation room, with disc media)
 - Processing speed: 1 mo. for 6 mo. data
- L2 Operation:
 - 3-4 versions of reprocessing including validation
 - Processing speed: 1.5 mo. for 6 mo. data
 - Lack of schedule management

(Self-rating)

- Whole operation was almost acceptable.
- Machine resources should be enhanced, esp. for L1B processing.

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Improvement of SMILES DPS

- DPS-L1 were based on the validation of L2 data retrieved from the new L1B sample data.
→ Reliable improvement, but some waste of time for discussion between L1 and L2 team.
- DPS-L2 initially had several problem:
 - Target data of validation; satellite, ground-based observation, or model calculation ?
 - Difficulty of discrimination of L1B- and L2-origin problem in L2 retrieval error

(Self-rating)

- Improvement of DPS-L1 and L2 are acceptable, from the point of view of 3-year reprocessing work.
- DPS-L2 team would demand more 2-year extension of re-reprocessing study to fulfill SMILES' potential.

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Data Distribution

- Service of preliminary data (v1.0 – v1.3, v2.0) to RA researchers (2010/1 -)
- Public release (v2.1) via SMILES project website (2012/3 -)
- Public release (after v2.4) via ISAS data center (2013/10 -)

(Self-rating)

- It is necessary to establish long-term data distribution scheme (system) in ISAS/JAXA.

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Science Team / Workshops / Outreach

- JAXA manages science team activity in order to encourage RA (Research Announcement) –based research themes with SMILES data.
- SMILES workshops were held in 2008, 2010 and 2011.
- Operation of SMILES website is ongoing.
 - <http://smiles.tksc.jaxa.jp/>
 - <http://darts.isas.jaxa.jp/iss/smiles/>
(for long-term data archiving)

(Self-rating)

- Efforts for these management works with minimum staffs and limited budget can be recognized.

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SMILES workshop 2010

- On 1-2 March 2010, held at ISAS/JAXA (Sagamihara, Japan)
- About 50 participants (10 of them are from overseas)



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Outreach (cont.) - Publications

- (2013) 8 articles (*4: accepted, 4: in the pipeline*)
other 2 articles in preparation
- (2012) 8 articles
- (2011) 2 articles
- (2010) 5 articles
- (2008) 1 article
- (- 2006) 14 articles

Total 34 peer-reviewed papers since 2000.
(Instrument: 16, Retrieval & Spectroscopy: 14, Science: 4)

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Outreach (cont.) – Ph.D. Thesis

- Takatoshi Sakazaki (2013), "Studies on diurnal variations in dynamical fields and ozone field in the stratosphere", Hokkaido Univ.
- Ochiai, Satoshi (2013), "Calibration and Evaluation of Submillimeter-Wave Radiometers for Atmospheric Observation", Osaka Prefecture Univ.
- Kuwahara, Toshihisa (2012), "Study of stratospheric chlorine monoxide and water vapor based on ground-based millimeter-wave observations over Atacama highland, Chile.", Nagoya Univ.
- Takahashi, Chikako (2012), "Development of the retrieval algorithm and capability study of high-precision ozone measurement for JEM/SMILES", Nagoya Univ.
- Verdes, Carmen (2002), "Deriving Atmospheric Temperature and Instrumental Pointing From Millimeter/Sub-Millimeter Limb Sounding Measurements.", Univ. of Bremen.
- Bühler, Stefan (1998), "Microwave Limb Sounding of the Stratosphere and Upper Troposphere.", Univ. of Bremen.

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Total self-rating of SMILES project in ISAS/JAXA

- Implementation of scientific activities with minimum human resources and limited budgets can be acknowledged.
- JAXA/ISAS should maintain SMILES' scientific activities (writing papers, entry to international conferences, and holding SMILES workshops); which will continue for 2 years (at first).
- DPS-L2 team will apply for competitive funds in order to keep our studies; but also we expect ISAS/JAXA will secure some budget (TBD) for re-processing of L1B/L2 data.

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Achievement of “Success Criteria” (defined inside JAXA)

	Observation	Science
Minimum Success	To obtain valid spectrum data for over 1 day [Achieved]	To retrieve vertical distribution of ozone, HCl and ClO with more precision than any existing observations [Achieved]
Full Success	To obtain valid spectrum data for 1 year [Partly achieved]	To retrieve global distribution and diurnal variation of atmospheric minor constituents including the species which has been rarely observed [Achieved]
Extra Success	To obtain valid spectrum data for over 1 year [Not achieved]	To detect unexpected distribution of minor constituents and/or atmospheric phenomenon [Partly achieved]

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Core Members of SMILES DPS-L2 and Science (As of Mar., 2013)

- Principle Investigator
 - M. Shiotani
- JAXA/ISAS
 - M. Takayanagi (Manager)
 - T. Sano (Sub-manager)
 - M. Suzuki (Science)
 - K. Imai (Validation Analysis; from Tome R&D)
- Fujitsu FIP (Contractor with JAXA)
 - C. Takahashi (Manager)
 - C. Mitsuda (Algorithm Implementation)
 - Y. Inoue (Data Product Operation)
- Kyoto Univ.
 - E. Nishimoto (Database Improvement)
 - Y. Naito (Climatology analysis)
- Chiba Univ.
 - N. Manago (Algorithm Improvement; former JAXA/ISAS staff)
- Cooperative Members
 - H. Ozeki (Spectroscopy)
 - H. Akiyoshi, D. Kinnison (Model calculation)
 - N. Nishi, M. Fujiwara, T. Sakazaki (Meteorology)
 - K. Takahashi, T. Imamura (Chemistry)

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RA Research Theme List (1/5)

Principal Investigator (Research Organization)	Research theme	
Yvan Orsolini (NILU, Norway)	Analyses and model comparison of JEM/SMILES observations of key minor constituents involved in stratospheric ozone chemistry	
William Read (JPL, USA)	JEM/SMILES Cloud/Humidity Products	
Arno de Lange (SRON, Netherlands)	JEM/SMILES validation by the balloon instruments TELIS and MIPAS-B	
Ian Boyd (NIWA, NZ)	Validation of JEM/SMILES Ozone Measurements by Ground Based Microwave Ozone Radiometers and Other Instruments at Two NDACC Sites	
Robert A. Stachnik (JPL, USA)	JEM/SMILES Validation using atmospheric observations by the JPL balloon-borne remote sensor suite	
Masatomo Fujiwara (Hokkaido Univ.)	Validation of ozone measured with the Superconducting Submillimeter-Wave Limb-Emission Sounder(SMILES) by ozonesonde measurements	

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RA Research Theme List (2/5)

Principal Investigator (Research Organization)	Research theme	
Joachim Urban (Chalmers Univ., Sweden)	Collaborative research based on atmospheric observations from SMILES and Odin	
Kaley Walker (Univ. of Toronto, Canada)	Validation of JEM-SMILES Measurements Using Infrared Fourier Transform Spectrometer Data Sets	
Yasuko Kasai (NICT)	JEM/SMILES L2 Research Processing, Validation and Science	
Masato Shiotani (Kyoto Univ. RISH)	Comparing the SMILES data with those from the Microwave Limb Sounder aboard the EOS Aura	
Tomoo Nagahama (Nagoya Univ. STE)	Monitoring of Mesospheric Composition Change associated with Solar-Terrestrial Environment Changes	
Toshihisa Kuwahara (Nagoya Univ. STE)	Investigation of diurnal and seasonal variations of stratospheric ClO based on ground-based millimeter-wave observations validated by the comparison with JEM/SMILES data	

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RA Research Theme List (3/5)

Principal Investigator (Research Organization)	Research theme	
Koji Imai (TOME R&D Inc./JAXA)	Stratospheric methyl cyanide (CH ₃ CN) from JEM/SMILES	
Makoto Suzuki (JAXA-ISAS)	Method of diurnal analysis for sun-nonsynchronous observation system using SMILES data	
Jana Mendrok (NICT)	Tropospheric ice cloud measurements from SMILES - Retrieval, validation, and science	
Satoshi Ochiai (NICT)	SMILES Level 1 Calibration (SMILES Level 1 Calibration)	
Satoshi Ochiai (NICT)	Ozone and ClO validation by millimeter-wave radiometer at Alaska	
Takafumi Sugita (NIES)	Quantitative evaluations of inorganic chlorine chemistry in the stratosphere using a photochemical model	
Kiyotaka shibata (MRI)	Study of zonally asymmetric distribution of ozone and related chemical species: Comparison between the SMILES data and the MRI chemistry-climate model data	

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RA Research Theme List (4/5)

Principal Investigator (Research Organization)	Research theme	Late Proposal
Hideaki Nagajima (NIES)	Validation of JEM/SMILES O ₃ , O ₃ -isotope, HCl, and HNO ₃ profiles with ground-based FTIR spectrometers in Rikubetsu and Tsukuba	
Makoto Suzuki (JAXA-ISAS)	Stratospheric SO ₂ observation from JEM/SMILES	
Mitsuteru Sato (Hokkaido Univ.)	Detection of the chemical effects caused by solar and TLE activities at the middle atmosphere from the SMILES observation	
Lawrence E. Flynn (NOAA/NESDIS)	Comparisons of ozone profiles and assimilation products from SMILES with those from SBUV/2	x
Francois Hendrick (Belgian Institute for Space Aeronomy)	Validation of JEM/SMILES BrO, HCl, and HNO ₃ measurements using ground-based instrument observations	x
Alexei Rozanov (Univ. of Bremen)	Cross-validation and quality improvement of vertical distributions of O ₃ and BrO number density retrieved from SMILES and SCIAMACHY measurements	x

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RA Research Theme List (5/5)

Principal Investigator (Research Organization)	Research theme	Late Proposal
Ding-Yi Wang (Univ. of New Brunswick)	Study of Stratospheric Dynamical Processes and Ozone Variations by Space-Based Multi-Sensor Datasets	x
Naoko Saitoh (Center for Environmental Remote Sensing, Chiba University)	Combined use of JEM/SMILES and GOSAT products for cross-validation of stratospheric minor species and study on stratospheric ozone chemistry in the Arctic	x
Shingo Watanabe (Research Institute for Global Change/JAMSTEC)	Cross-validations of SMILES level 2 products against results of chemistry climate models	x

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