

(Instructions and Distribution on Reverse)

1. CONTRACTOR: SSAI	2. CONTRACT NO.: NNG12HP06C	3. TASK/REVISION NO.: CY4 2 07
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4. JOB ORDER NO./PROJECT:	5. FLIGHT HARDWARE/SOFTWARE; CRITICAL GSA (IF, YES, OBTAIN BLOCK 16 CONCURRENCE): YES <input checked="" type="checkbox"/> NO	6. DESIGNATED FLIGHT ASSURANCE MGR.:
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7. DESCRIPTION OF WORK TO BE PERFORMED (OBJECTIVES OR RESULTS DESIRED):

GMAO Model Development

8. TASK DOCUMENTATION REQUIREMENTS/DELIVERABLE ITEMS:

See Attached

9. PERFORMANCE/MILESTONE SCHEDULE:

February 1, 2015 – January 31, 2016

10. QUALITY ASSURANCE REQUIREMENTS:

11. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:

12. OTHER (FUNDING, NTE, HOURS, ETC.):

	From	By	To
Estimated Cost			
Fixed Fee			
Estimated Total Cost-Plus-Fixed Fee	\$730,885	\$1,655	\$732,540

13. TASK ORIGINATOR/MONITOR/CODE/PHONE:

William Putman

14. BRANCH APPROVAL:

15. DIVISION CONCURRENCE:

18. THIS TASK ORDER IS ISSUED PURSUANT TO THE TERMS OF THE CONTRACT.

Makara Nevils
CONTRACTING OFFICER'S SIGNATURE/ DATE **8/11/15**

16. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE:

Stephen Cohn

17. CONTRACTOR SIGNATURE:

Makara Nevils
TYPED OR PRINTED NAME

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See Attached

9. PERFORMANCE/MILESTONE SCHEDULE:

February 1, 2015 – January 31, 2016

10. QUALITY ASSURANCE REQUIREMENTS:

11. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:

12. OTHER (FUNDING, NTE, HOURS, ETC.):

	From	By	To
Estimated Cost			
Fixed Fee			
Estimated Total Cost-Plus-Fixed Fee	\$651,565	\$79,320	\$730,885

13. TASK ORIGINATOR/MONITOR/CODE/PHONE:
~~Sigfried Schubert~~ **William Putman**

18. THIS TASK ORDER IS ISSUED PURSUANT TO THE TERMS OF THE CONTRACT.

14. BRANCH APPROVAL:

15. DIVISION CONCURRENCE:

Makara Nevils
CONTRACTING OFFICER'S SIGNATURE/ DATE **5/21/15**

16. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE:
Stephen Cohn

17. CONTRACTOR SIGNATURE:

Makara Nevils
TYPED OR PRINTED NAME

(Instructions and Distribution on Reverse)

1. CONTRACTOR: SSAI	2. CONTRACT NO.: NNG12HP06C	3. TASK/REVISION NO.: CY4 0 07
4. JOB ORDER NO./PROJECT:	5. FLIGHT HARDWARE/SOFTWARE; CRITICAL GSA (IF, YES, OBTAIN BLOCK 16 CONCURRENCE): YES <input checked="" type="checkbox"/> NO	6. DESIGNATED FLIGHT ASSURANCE MGR.:

7. DESCRIPTION OF WORK TO BE PERFORMED (OBJECTIVES OR RESULTS DESIRED):

GMAO Model Development

8. TASK DOCUMENTATION REQUIREMENTS/DELIVERABLE ITEMS:

See Attached

9. PERFORMANCE/MILESTONE SCHEDULE:

February 1, 2015 – January 31, 2016

10. QUALITY ASSURANCE REQUIREMENTS:

11. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:

12. OTHER (FUNDING, NTE, HOURS, ETC.):

Estimated Cost
Fixed Fee
Estimated Total Cost-Plus-Fixed Fee \$ 651,565

13. TASK ORIGINATOR/MONITOR/CODE/PHONE:

William Putman/610.1/6-2599

14. BRANCH APPROVAL:

15. DIVISION CONCURRENCE:

16. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE:

Stephen Cohn

17. CONTRACTOR SIGNATURE:

18. THIS TASK ORDER IS ISSUED
PURSUANT TO THE TERMS OF THE
CONTRACT.


CONTRACTING OFFICER'S
SIGNATURE/ DATE **Ayana A. Briscoe**
Contracting Officer

TYPED OR PRINTED NAME

Science Systems and Applications, Inc.
NNG12HP06C
Task Order Statement of Work

Task Order Number: CY4_07 Mod0
Task Order Title: GMAO Model Development

1.0 Task Monitor (TM):

Name: William Putman
Organization: GMAO:GMAO
Email Address: william.m.putman@nasa.gov

2.0 Description of Work to be Performed

The changes from Mod 0 to Mod 1 (CY2) for this task are as follows:

1. Subtask A: Elements (ii), (v) and (ix) are eliminated and replaced by new elements (ii) and (iv). Element (x) is expanded upon in the new element (viii). The remaining elements have been reorganized and updated slightly.
2. Subtask B: There is a new element (iii). The other elements have been reorganized and updated slightly.
3. Deliverables/Reporting Requirements and Travel Authorized are changed accordingly.
4. The TM changes from Max Suarez to Bill Putman.

There are no major changes from CY2 MOD1 to CY3 MOD0.

Changes from CY3 to CY4 are indicated in red.

The contractor will support the maintenance and development of the GMAO's Earth System Model and its application to data assimilation, weather and climate prediction, and various scientific studies. The work will include (i) supporting the development of individual model components, such as GMAO's Atmospheric General Circulation Model (AGCM) and GMAO's Land Surface Model (LSM); (ii) the development and integration of external components, such as the sea- and land-ice models, into the GMAO's GEOS modeling and assimilation system; (iii) supporting the integration of externally developed components, as specified by the TM; and (iv) the use of the GEOS system for the various applications.

Subtask A: Model development and documentation

- (i) Implement and validate physical parameterizations in the atmosphere and land surface models.

- (ii) Enhance and maintain an extensive suite of automated software for evaluating GEOS model and ADAS products, referred to as the GEOS Climate Diagnostics Package (GCDP). Evaluation will include comparisons with observations and with available reanalysis products for the atmosphere and land surface. Software implementation will include a state-of-the-science satellite simulator within GEOS-5 and as a post-processor. Develop and maintain the software to display model simulations and available validation data and the output from the GCDP on the GMAO website.
- (iii) Develop software and utilities as necessary to process model output in required formats and to re-grid restart and boundary files needed for different model configurations, including different resolutions. Retrieve and process initial and boundary data sets required for model test and integration.
- (iv) Develop, as needed for updated model tags and new atmospheric analyses, and maintain the REPLAY capability for GEOS-5.
- (v) Support the development and use of various GEOS single-column model (SCM) configurations. This sub-element will require managing the results of extensive sensitivity sweeps, and implementing new forcings in the SCM framework.
- (vi) Support the development and use of the GEOS doubly-periodic model (DPM) configurations. This sub-element will require managing the results of extensive sensitivity sweeps, and implementing GOCART and interactive aerosols in the DPM framework for new micro-physics evaluation.
- (vii) Contribute to the development of a terrestrial carbon cycle component of GEOS-5 by integrating dynamic vegetation modules with the Catchment Land Surface Model (LSM), as directed by the TM and/or GMAO's lead developer for the Catchment LSM.
- (viii) Continue implementation and maintenance of the CICE sea-ice module within the GEOS-5 model suite. Tune the model for scientific simulations of the current climate and analyze the sea-ice variability in GEOS-5 climate simulations. Contribute to the implementation of the land ice component in GEOS-5. Begin implementation of the Ice Sheet System Model (ISSM) within GEOS-5.
- (ix) Conduct climate and numerical weather prediction simulations, including very high resolution simulations, to evaluate model performance and post the results from the standard suite of model diagnostics and comparisons.
- (x) Provide support for collaborations with investigators funded by NASA's Modeling, Analysis and Prediction program, as specified by the TM and/or the GMAO Chief. Examples are preparing initial conditions for model simulations and documenting procedures for AGCM and/or SCM simulations on NASA HEC platforms. Provide authorization for approved external investigators to access the external SVN GEOS model repository.
- (xi) Maintain internal and external web pages for communications regarding model experiments and performance, including the GEOS-5 wiki.
- (xii) Perform software configuration management for the GEOS AGCM and LSM. Perform the GMAO specified testing, validation, and documentation procedures of all model tags released internally or externally, including maintenance of a detailed change log of model modifications.

Subtask B: Support for model integration into the GMAO atmospheric data assimilation systems (ADAS)

- (i) Provide support for testing and evaluation of the interaction between the model and the analysis systems, as specified by the TM and/or the GMAO Chief.
- (ii) Evaluate the impact of new parameterizations and increased horizontal and vertical resolution on the performance of the ADAS.
- (iii) Prepare the GEOS model and interface with NCEP and ECMWF analyses to support regular forecasts with initial conditions from those analyses (G5NCEP and G5EC).
- (iv) Maintain the model interfaces to the ADAS.

3.0 Special Requirements

None

4.0 Performance/Milestone Schedule

The GMAO Contract Year 4 POP is February 01, 2015 - January 31, 2016

5.0 Deliverables/Reporting Requirements

All subtasks will provide software/algorithm documents and user guides in conformance with GMAO guidelines as appropriate. Monthly progress reports will be provided.

Subtask A

- Conduct of specified NWP and Climate-relevant simulations for the evaluation of physics parameterizations and other developments for the GEOS-5 the stand-alone AGCM, coupled and stand-alone versions of the LSM, and for the fully coupled atmosphere-ocean climate model, with the output from the GCDP posted on the GMAO web site. Evaluation metrics to be defined in collaboration with the GMAO civil service staff, as appropriate and as specified by the TM and/or GMAO Chief. Progress on new developments and results of simulations are to be presented at regular GEOS AGCM modeling meetings.
- Conduct idealized experiments with GEOS-5 AGCM for both global and doubly periodic simulations to evaluate model updates including increased horizontal and vertical resolution, physics parameterizations and micro-physics integration.
- Facilitate integration of GEOS AGCM model updates and increased horizontal and vertical resolution in the parallel and operational ADAS and assessment of impact on forecast skill.
- Updates included in new tag releases are documented on the GEOS modeling web site at the time of release.
- The integrity of the REPLAY capability is verified for new tags and atmospheric analyses as requested by the TM.
- Visuals (movies, plots/graphics, powerpoint slides), as required by civil service staff, to be of publication quality.
- Requests for access to the external SVN GEOS repository to be filled within two business days, unless the request was denied by the TM.

Subtask B

- Progress on integration with the GEOS analysis and results from tests of the impact of new developments on the ADAS are to be presented at appropriate GMAO internal development meetings.
- When updates to the ADAS are planned, deliver the model tag that has to be integrated with the analysis tag to the ADAS integration team according to the schedule specified by the TM and/or GMAO Chief, ensuring that the updated ADAS and diagnostic tools work correctly and with computational efficiency.

6.0 Other Information Needed for Performance of Task

Travel Authorized: Two domestic trips under one week for this performance period. Local travel for training purposes, not to exceed 5 person-days, will be authorized at the request of the TM or the GM.

7.0 Data Rights

N/A

8.0 Safety

Staff on this task will comply with federal, state, local, and center safety regulations. This will be accomplished through management emphasis, technical training, and personal responsibility. Staff will participate in safety orientation and training in accordance with the contract Safety and Health Plan, and work within the requirements of that plan.

9.0 Risk

Contractor shall provide ongoing risk assessment and mitigation in performance of the Task Order. Priorities shall be re-evaluated as appropriate with the TM. Cost and schedule performance shall be assessed on a regular basis (no less frequently than monthly) and significant variations discussed and acted on in consultation with the TM and COTR.

10.0 Proposed Cost and Fixed Fee

In accordance with Paragraph B.5, of the contract, propose the Cost and Fixed Fee amount.