pospheric and orbit correction) spanned from 15 to 68 percent. With this tropospheric correction, low-frequency errors can be removed from InSAR images. Additionally, results show that for days with high-quality ECMWF data, the SBLM ZTD correction performs as well as the GPS ZTD correction. Finally, the tropospheric correction enabled

orbit correction, and by correcting for both errors, the quality of the InSAR images increased significantly.

By correcting for the troposphere, other errors become visible. The main contributor to the remaining errors is uncertainties with determining the satellite orbit. Because the orbit error is now separated from the tropospheric error, the

orbit can be corrected for more accurately.

Technique for Calculating Solution Derivatives With Respect to Geometry Parameters in a CFD Code

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A solution has been developed to the challenges of computation of derivatives with respect to geometry, which is not straightforward because these are not typically direct inputs to the computational fluid dynamics (CFD) solver. To overcome these issues, a procedure has been devised that can be used without having access to the mesh generator, while still being applicable to all types of meshes. The basic approach is inspired by the mesh motion algorithms used to deform the interior mesh nodes in a smooth manner when the surface nodes, for example, are in a fluid structure interaction problem. The general idea is to model the mesh edges and nodes as constituting a spring-mass system. Changes to boundary node locations are propa-

gated to interior nodes by allowing them to assume their new equilibrium positions, for instance, one where the forces on each node are in balance.

The main advantage of the technique is that it is independent of the volumetric mesh generator, and can be applied to structured, unstructured, single- and multi-block meshes. It essentially reduces the problem down to defining the surface mesh node derivatives with respect to the geometry parameters of interest. For analytical geometries, this is quite straightforward. In the more general case, one would need to be able to interrogate the underlying parametric CAD (computer aided design) model and to evaluate the derivatives either analytically, or by a finite difference tech-

nique. Because the technique is based on a partial differential equation (PDE), it is applicable not only to forward mode problems (where derivatives of all the output quantities are computed with respect to a single input), but it could also be extended to the adjoint problem, either by using an analytical adjoint of the PDE or a discrete analog.

Acute Radiation Risk and BRYNTRN Organ Dose Projection Graphical User Interface

This program estimates the whole-body effective dose, organ doses, and acute radiation sickness symptoms.

Lyndon B. Johnson Space Center, Houston, Texas

The integration of human space applications risk projection models of organ dose and acute radiation risk has been a key problem. NASA has developed an organ dose projection model using the BRYNTRN with SUM DOSE computer codes, and a probabilistic model of Acute Radiation Risk (ARR). The codes BRYNTRN and SUM DOSE are a Baryon transport code and an output data processing code, respectively. The risk projection models of organ doses and ARR take the output from BRYNTRN as an input to their calculations. With a graphical user interface

(GUI) to handle input and output for BRYNTRN, the response models can be connected easily and correctly to BRYNTRN. A GUI for the ARR and BRYNTRN Organ Dose (ARRBOD) projection code provides seamless integration of input and output manipulations, which are required for operations of the ARRBOD modules.

The ARRBOD GUI is intended for mission planners, radiation shield designers, space operations in the mission operations directorate (MOD), and space biophysics researchers. BRYNTRN code operation requires extensive

input preparation. Only a graphical user interface (GUI) can handle input and output for BRYNTRN to the response models easily and correctly. The purpose of the GUI development for ARRBOD is to provide seamless integration of input and output manipulations for the operations of projection modules (BRYNTRN, SLMDOSE, and the ARR probabilistic response model) in assessing the acute risk and the organ doses of significant Solar Particle Events (SPEs).

The assessment of astronauts' radiation risk from SPE is in support of mis-