2010 IEEE International Geoscience and Remote Sensing Symposium

Hawaii 2010 IGARSS

30th Anniversary

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GRSS IEEE

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- EXTENDED SUBMISSION DEADLINE: Friday December 18, 2009 at 11:59PM US Central Standard Time. This extension applies also to the student paper contest.

Welcome to IGARSS 2010

Remote Sensing: Global Vision for Local Action

On behalf of the IEEE Geoscience and Remote Sensing Society and the IGARSS 2010 Organizing Committee, we are pleased to invite you to Honolulu for IGARSS 2010. We are thrilled to be returning to Hawaii to host IGARSS on its 30th anniversary! In the true spirit of an international event, we will continue our tradition of gathering world-class scientists, engineers, and educators engaged in the fields of geosciences and remote sensing from around the world. We anticipate well over one thousand participants to enjoy a week of technical sessions, tutorials, exhibits and social activities.

For this 30th anniversary IGARSS we will celebrate our accomplishments over three decades of leadership in remote sensing instrumentation, techniques, and applications development. But perhaps more importantly we will look ahead to the future of our field with some fresh approaches and perspectives through our conference theme: Remote Sensing: Global Vision for Local Action. One such activity will be embodied in our plenary session, which will focus on the emerging field of Community Remote Sensing. We hope this plenary session, along with special tutorials and technical sessions, will inspire and excite our community for what is possible in the coming decade. We look forward to seeing you in Honolulu in July 2010!

Karen St.Germain and Paul Smits
General Co-Chairs

Abstract Submission

Participation in IGARSS is open to all individuals interested in or working in the fields of geoscience and remote sensing. Abstracts received by the deadline will be considered for program placement under the standard peer review process. Late abstracts cannot be accepted due to the large number of submissions and short review schedule. The IEEE IGARSS 2010 Technical Program Committee will organize all accepted abstracts into either oral or interactive poster sessions based upon their potential contribution to the symposium and the composition of high-quality sessions. Session Co-chairs will be appointed as early as possible to help TPC setting the highest quality for oral and interactive sessions. Only accepted papers that are registered and presented at the symposium in Honolulu will be published in the symposium proceedings and be assigned an IEEE GRSS publication reference. The list of specialty projects and themes associated with community remote sensing will be soon available on the symposium website.

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DATA VISUALIZATION AND ANALYSIS TOOLS FOR THE GLOBAL PRECIPITATION MEASUREMENT (GPM) VALIDATION NETWORK

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The Validation Network (VN) prototype for the Global Precipitation Measurement (GPM) mission compares data from the Tropical Rainfall Measuring Mission (TRMM) satellite Precipitation Radar (PR) to similar measurements from U.S. and international operational weather radars. This prototype is a major component of the GPM Ground Validation System (GVS). The VN provides a means for the precipitation measurement community to identify and resolve significant discrepancies between the ground radar (GR) observations and similar satellite observations. The VN prototype is based on research results and computer code described by Anagnostou et al. (2001), Bolen and Chandrasekar (2000), and Liao et al. (2001), and has previously been described by Morris, et al. (2007). Morris and Schwaller (2009) describe the PR-GR volume-matching algorithm used to create the VN match-up data set used for the comparisons. This paper describes software tools that have been developed for visualization and statistical analysis of the original and volume matched PR and GR data.

Table 1. Mean difference between PR and original (GR) and frequency-corrected (GR_{Ku}) WSR-88D reflectivity for stratiform rain volumes above the bright band. Negative values indicate WSR-88D higher than TRMM PR.

Radar ID	$PR-GR_{Ku}$ Mean Difference (dBZ)	PR-GR Mean Difference (dBZ)	PR Mean Reflectivity (dBZ)	Total Samples
KAMX	0.03	-0.49	22.65	2304
KCLX	-0.76	-1.42	23.54	9071
KFWS	0.97	0.43	23.78	11910
KGRK	2.63	2.19	24.19	6871
KJAX	-0.72	-1.33	22.95	4509
KLCH	-1.34	-2.06	23.54	4071
KMLB	0.71	0.26	22.52	2787
KMOB	1.00	0.50	23.37	4772
KTLH	-1.62	-2.34	23.37	3280

The core VN dataset consists of volume-matched TRMM PR and quality-controlled, ground-based WSR-88D (Weather Surveillance Radar – 1988 Doppler, or WSR-88D) radar reflectivity, for 21 sites in the southeastern U.S. PR data include radar reflectivity (both raw and attenuation corrected), near-surface rain rate, and other variables. Only reflectivity is analyzed for the GR. For cases when a PR/GR overlap event occurs with a significant (minimum ~1600 km^2) total area of precipitation echoes within 100 km of the GR, the geometry-matching component of the VN software suite performs a spatial match-up of the PR and GR data to common 3-D volumes by calculating PR and GR averages at the geometric intersection of the PR rays with the individual GR radar elevation sweeps. The along-ray PR data are averaged only in the vertical, between the top and bottom height of each GR elevation sweep intersected. The GR data are averaged only in the horizontal within the individual elevation sweep surfaces, over an area centered on each intersected PR ray. Match-up data are restricted to within a 100 km radius of the GR site, where the GR sample values have sufficient vertical resolution and GR overshooting of precipitation echoes is minimal.

Three primary software tools have been written for analysis and visualization of the volume-matched PR and GR data: (1) bulk statistical analysis tool; (2) case study statistical analysis and display tool, and 3) the vertical cross section analysis tool. The bulk statistical analysis tool processes data for the entire VN match-up data set to produce PR-GR mean differences and related statistics for categories consisting of permutations of: GR site, date/time of the overpass, sample height (13 layers, 1.5 km deep, from 1.5 to 19.5 km), rain type (convective, stratiform, other), proximity to the bright band (above, below, within), percent of volume above reflectivity thresholds, and range category from the GR (0-50 km, 50-100 km).

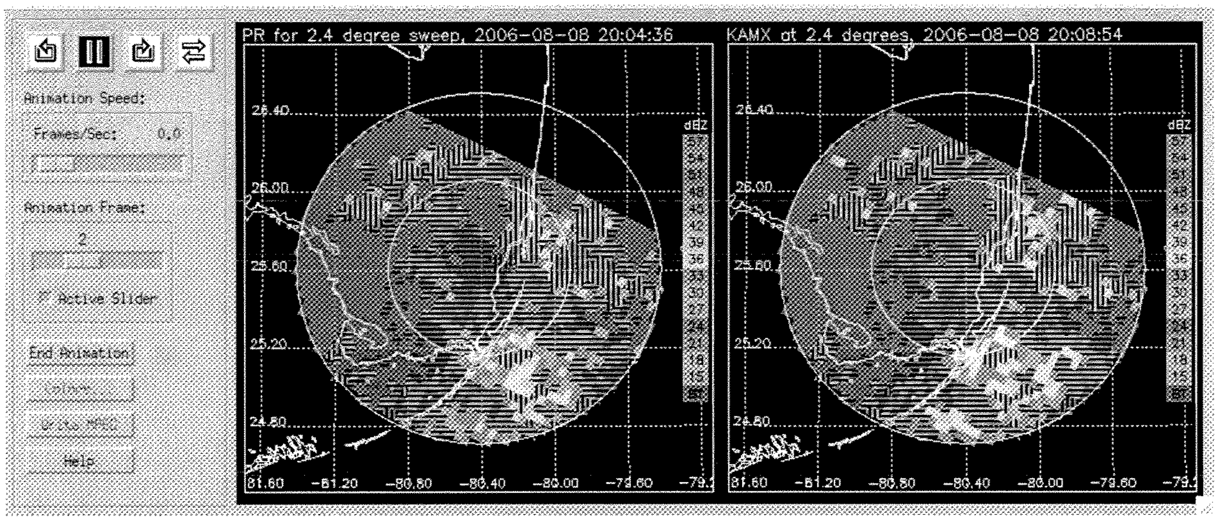

Figure 1. PPI Animation Display of the VN Statistical Analysis and Display Tool, showing volume-matched PR (left) and GR (right) data.

These split-out data are stored in a database table. Queries to the database allow the statistical data to be combined and recategorized in a flexible manner. For example, Table 1 presents the PR-GR mean difference in dBZ for individual VN WSR-88D radars, for both the original S-band GR reflectivity (GR) and the frequency-corrected GR reflectivity (GR_{Ku}), for all samples categorized as stratiform rain type, above the bright band, and where fewer than five percent of PR and GR bins were rejected as "below threshold" in the sample averages. In the same manner, the bulk data can be split out by site and date to produce time series of site-specific PR-GR mean reflectivity, or to analyze the results by region or season.

The two primary visualization tools are the statistical analysis tool and the vertical cross section tool, which allow display and analysis of VN match-up data for individual site overpass events. For spatial orientation, the statistical analysis tool can display PPIs of volume-matched data (Fig. 1) as an animation loop progressing from low to high elevation sweeps. The statistical analysis tool vertically stratifies the data to produce tabular and graphical displays, including vertical profiles of PR and GR reflectivity from match-up data averaged over the constant height levels, and histograms of PR and GR reflectivity for match-up data stratified by proximity to the bright band (Fig. 2); scatter plots of PR vs. GR reflectivity

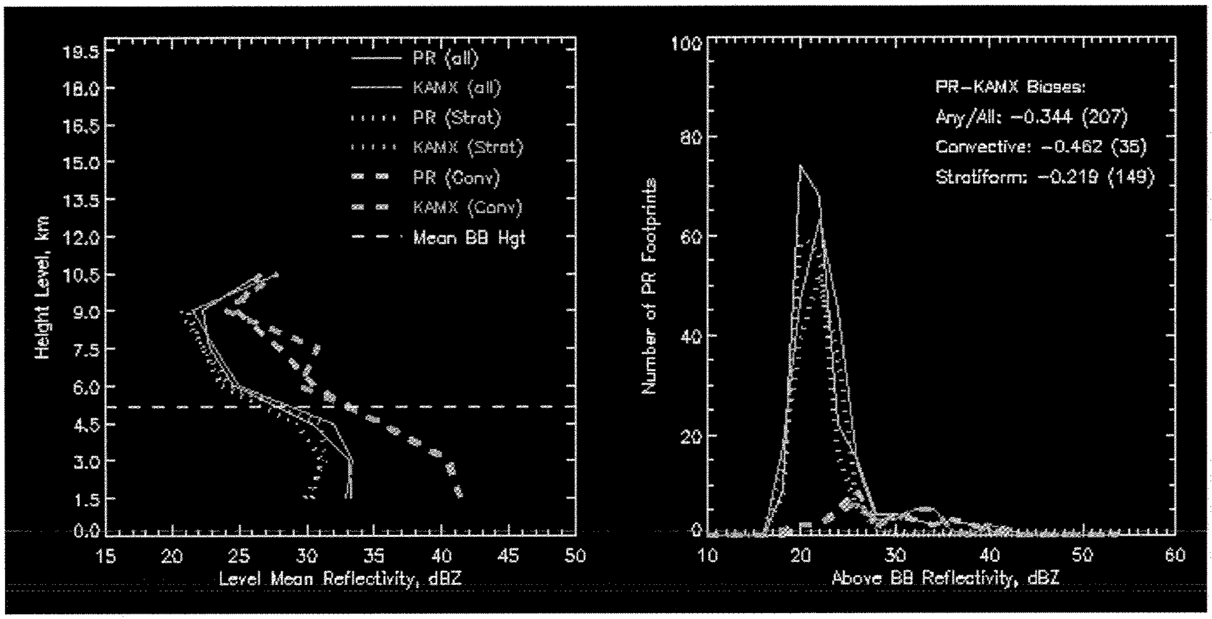

Figure 2. Vertical profile (left) and histogram of volume-matched PR (green) and GR (red) reflectivity, by rain type. Only the histogram for the above-bright-band category is shown in this example. Example as shown represents the on-screen appearance of the program output.

categorized by rain type and proximity to the bright band (Fig. 3); and tables of PR-GR mean difference broken out by rain type, for both the constant-height data levels and the levels defined as proximity to the bright band. The statistical analysis tool supports studies of calibration differences between the PR and GR as well as the evaluation of the quality of the TRMM PR attenuation correction algorithm.

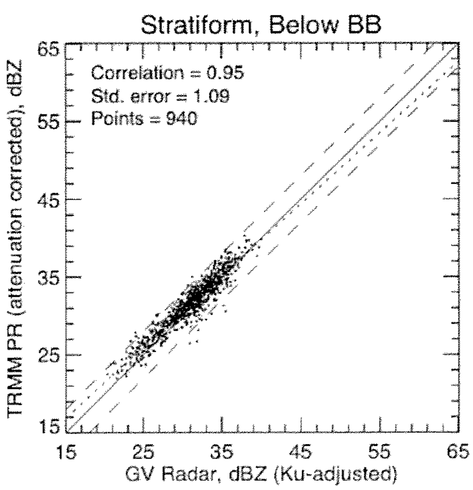

Figure 3. Scatter plot of PR vs. GR reflectivity for stratiform rain points above the bright band.

The vertical cross-section tool generates cross sections of the PR and GR reflectivity match-up data (Fig. 4) and PR-GR reflectivity difference (not shown) along a selected PR scan line. If the original 2A-25 TRMM PR product files are available, cross sections of full-vertical-resolution (250 m) PR data can also be displayed for comparison to the volume-averaged PR match-up data. The cross-section tool was developed primarily to investigate differences seen between the PR and GR volume match data within and below the melting layer in stratiform rain, and to evaluate the quality of the PR attenuation correction algorithm in convective and heavy stratiform rain cases. Both tools provide the ability to apply the Liao/Meneghini S-band to Ku-band frequency adjustments (Liao and Meneghini, 2009) to the reflectivity data, and to filter the data volumes according to the reflectivity percent above threshold criteria.

These software tools are being made available as open source code via the NASA/GSFC Innovative Partnerships Program Office (http://opensource.gsfc.nasa.gov). Information about the match-up data files and statistical products, including documentation and how to gain online access to them, can be found on the GPM ground validation web site (http://gpm.gsfc.nasa.gov/groundvalidation.html).

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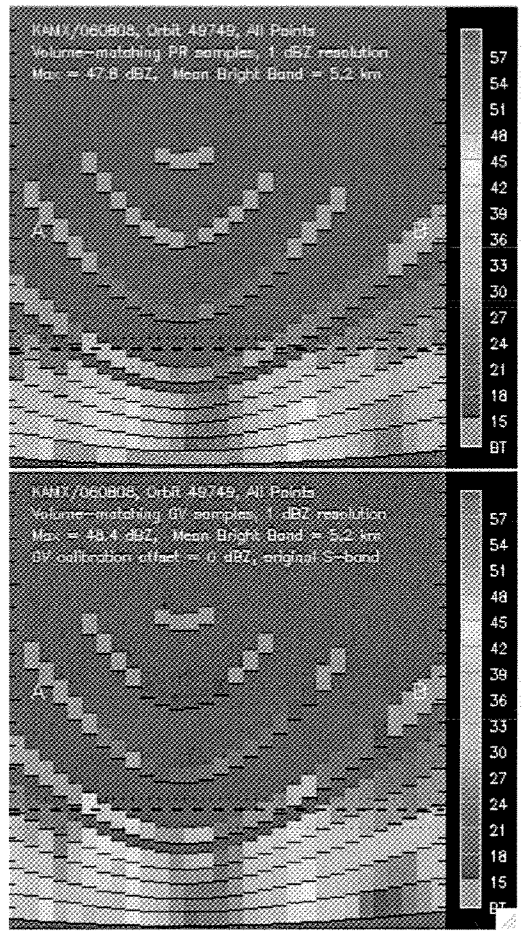

Figure 4. Vertical cross section of volume-matched PR (top) and GR (bottom) data.