

Earth Observing System Data and Information System



2013 Customer Satisfaction Results

November 2013

Today's Discussion

- **Background**
 - Objectives
 - Data Collection
 - Respondent Information
- **Overview of Key Results**
- **Detailed Analysis**
- **Summary**

Background

Project Background - Objectives

WHAT

- Measure customer satisfaction with NASA Earth Observing System Data and Information System at a national level for each Data Center
- Identify the key areas that NASA can leverage across the Data Centers to continuously improve its service to its customers
- Assess the trends in satisfaction with NASA EOSDIS specifically in the following areas:
 - Product Search
 - Product Selection and Order
 - Delivery
 - Product Quality
 - Product Documentation
 - Customer Support



HOW

- Data collection via the web
 - Targeted email invitations to EOSDIS users sent by CFI Group
 - Survey invitations and reminders sent from DAAC User Services team
 - Survey link posted on ASDC website



Project Background – Data Collection

MEASUREMENT TIMETABLE

- Finalized questionnaire: July 2013
- Data collection: August 20, 2013 - October 6, 2013
- Topline Results: October 18, 2013
- Results Briefing: November 21, 2013

SAMPLE SIZES

Data Center	Original Sample List	Bounceback Total	Net Invitations	Completed survey via unique link	Completed survey via generic link	Total Completed Surveys
ASDC-LaRC	2551	145	2406	124	75	199
ASF SAR DAAC	2187	237	1950	104	126	230
CDDIS	10929	7041	3888	125	53	178
GES DISC	2750	602	2148	118	84	202
GHRC	1145	174	971	47	29	76
LP DAAC	40754	1843	38911	933	1011	1944
MODAPS LAADS	23380	6824	16556	275	97	372
NSIDC DAAC	19534	4884	14650	229	147	376
OBPG/Ocean Color	5304	921	4383	93	24	117
ORNL DAAC/FLUXNET	4294	197	4097	56	110	166
PO DAAC-JPL	2634	459	2175	94	49	143
SEDAC	4298	197	4101	67	76	143
Total	119760	23524	96236	2265	1881	4146



LP DAAC is data center most used

Respondent Information

	2009	2010	2011	2012	2013
Data center evaluated					
ASDC-LaRC	4%	5%	5%	4%	5%
ASF SAR DAAC	3%	3%	4%	5%	6%
CDDIS	4%	6%	2%	4%	4%
GES DISC	3%	3%	2%	3%	5%
GHRC	2%	2%	2%	2%	2%
LP DAAC	39%	41%	46%	46%	47%
MODAPS LAADS	18%	17%	12%	11%	9%
NSIDC DAAC	8%	9%	10%	11%	9%
OBPG/Ocean Color	7%	6%	5%	4%	3%
ORNL DAAC/FLUXNET	4%	4%	6%	5%	4%
PO DAAC-JPL	5%	3%	2%	3%	3%
SEDAC	3%	3%	3%	3%	3%
Number of Respondents	3,842	4,390	3,996	4,315	4,146

LP DAAC accounts for the most responses (47%).

No other data center accounted for as much as 10% of responses.

MODAPS LAADS and NSIDC DAAC each account for 9%.

Land remains most popular area of need; Specific search most used

Respondent Information

	2010	2011	2012	2013
General areas need or use Earth science data and services~				
Atmosphere	36%	35%	34%	28%
Biosphere	18%	20%	18%	19%
Cryosphere	10%	12%	12%	10%
Land	61%	65%	62%	68%
Human dimensions	10%	11%	11%	15%
Near-real-time applications	14%	14%	15%	14%
Ocean	22%	21%	21%	17%
Space geodesy	9%	7%	9%	9%
Calibrated radiance	12%	12%	11%	10%
Other general area	7%	8%	10%	11%
Number of Respondents	4,387	3,996	4,315	4,146

Searched-Requested-Ordered-Visualized-Download from DAAC				
Have used DAAC	94%	93%	91%	92%
Have not used	6%	7%	9%	8%
Number of Respondents	4,390	3,996	4,315	4,146

Method of searching for data products or services				
Data center's or data-specific specialized search, online holdings or datapool	52%	60%	61%	41%
Direct interaction with user services personnel	4%	3%	3%	3%
Global Change Master Directory	1%	1%	1%	2%
Internet search tool	17%	15%	17%	28%
Land Atmosphere Near Real -Time Capability for EOS	--	--	2%	3%
OPeNDAP	--	--	1%	1%
Reverb	18%	14%	8%	13%
THREDDS	--	--	0%	0%
Did not search	4%	4%	4%	4%
Other	3%	3%	3%	5%
Number of Respondents	4,114	3,699	3,938	3,812

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

Just over two-thirds of respondents had land as a general areas of need or use.

Atmosphere is a distant second with 28% of respondents.

Data center's or data-specific search, online holdings or data pool is most used (41%) search method.

Earth Explorer used by nearly half of respondents

Respondent Information

	2010	2011	2012	2013
Search-Holdings-Data Pool used~				
DADDI	1%	0%	0%	2%
Data Miner Tool	2%	1%	1%	3%
Earth Explorer	--	--	20%	48%
GDEx	--	--	0%	2%
Giovanni	6%	6%	4%	9%
GloVis	24%	27%	17%	35%
HITIDE	--	0%	0%	1%
HyDRO	1%	1%	1%	3%
IceBridge Data Portal	--	--	0%	2%
LAADS	22%	17%	12%	13%
Live Access Server (LAS)	--	--	1%	2%
LP DAAC Data Pool	--	--	--	30%
Mercury (Advanced Product Search)	0%	0%	0%	1%
Mirador	2%	2%	2%	5%
MISR Order Tool	1%	1%	1%	3%
MIST	1%	2%	1%	3%
MODIS Land Products Subsets	23%	23%	18%	37%
NOESIS	0%	0%	0%	1%
NSIDC Data Pool	--	4%	6%	11%
PO.DAAC Dataset Discovery	--	--	3%	3%
POET	1%	1%	1%	1%
Polaris	--	0%	0%	1%
SAGE	--	--	0%	1%
SeaDAS	6%	5%	3%	4%
Spatial Data Access Tool (SDAT)	2%	1%	1%	4%
URSA	2%	2%	2%	5%
Vertex	--	--	1%	3%
WebGIS	3%	3%	2%	7%
Other	5%	4%	4%	5%
Number of Respondents	2,094	2,200	2,393	1,557

-- Percents dashed due to questionnaire changes

While no search method is used by a majority of respondents, Earth Explorer is used by 48%.

GloVis, MODIS Land Products Subsets and LP DAAC Data Pool are used by at least 30% of respondents.

Just over three-fourths got data products; GeoTIFF most preferred format

Respondent Information

	2010	2011	2012	2013
Got data products in the last year				
Got data products	--	--	81%	76%
Did not get data products	--	--	19%	24%
Number of Respondents			3,938	3,812

Downloaded data or received data				
Downloaded	--	--	--	97%
Have not downloaded	--	--	--	3%
Number of Respondents				2,898

Preferred data format~				
ASCII	--	--	--	34%
Binary	--	--	--	12%
CEOS format (SIR-C/SAR data)	--	--	--	5%
GeoTIFF	--	--	--	68%
HDF4	--	--	--	16%
HDF-EOS profile of HDF4	--	--	--	11%
HDF5	--	--	--	18%
HDF-EOS profile of HDF5	--	--	--	10%
JPEG, GIF, PNG, TIFF	--	--	--	26%
KMZ/KML	--	--	--	20%
NetCDF classic	--	--	--	12%
NetCDF4	--	--	--	12%
Other GIS (GRID, BIL, e00, etc.)	--	--	--	16%
SHP	--	--	--	38%
Other	--	--	--	4%
Number of Respondents				2,798

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

Just over three-fourths of respondents got data products in the last year.

Nearly all (97%) of them downloaded – or received data.

GeoTIFF was the most preferred format (68%) for over two-thirds of respondents.

Windows most common operating system; Most do use software tools

Respondent Information

	2010	2011	2012	2013
Operating system use for data analysis~				
Windows	79%	78%	78%	83%
Mac OS	11%	12%	13%	13%
Linux	33%	33%	34%	30%
UNIX	9%	8%	7%	6%
Other	1%	1%	0%	0%
Number of Respondents	4,038	3,673	3,177	2,798

Used a software tool to work with the data				
Yes, used software tools	85%	87%	77%	82%
Yes, made my own using programming language	--	--	17%	12%
No, I couldn't find what I needed	2%	2%	0%	1%
No, I couldn't understand how to use it	2%	2%	1%	1%
No, I did not need software tools	12%	10%	4%	4%
Number of Respondents	4,040	3,673	3,177	2,798

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

Windows was used by over four-fifths of respondents.

Linux accounted for 30% of operating systems used.

82% used software tools to work with the data, while only 12% made their own.

ArcGIS used by nearly two-thirds of those using tools

Respondent Information

	2010	2011	2012	2013
Tools use to work with data~				
ArcGIS	50%	52%	59%	65%
ENVI	43%	41%	44%	43%
ERDAS/IMAGINE	29%	27%	28%	31%
Excel	--	--	24%	30%
Ferret	--	--	1%	1%
Geomatica	5%	4%	4%	5%
Global Mapper	8%	10%	12%	15%
GrADS	6%	4%	4%	3%
GRASS	--	--	9%	12%
HDFView	16%	15%	12%	12%
HEG	3%	3%	3%	2%
IDL	24%	21%	18%	16%
IDV	--	--	1%	1%
IDRISI	7%	8%	7%	11%
LAS	--	--	1%	1%
MATLAB	25%	24%	24%	21%
MODIS Reprojection Tool	19%	18%	17%	15%
NCL	2%	2%	2%	2%
Panoply	--	--	3%	3%
Quantum GIS	--	--	15%	23%
R	--	--	--	16%
SeaDAS	7%	6%	6%	4%
Other/OpenSource	20%	22%	17%	16%
Number of Respondents	3,432	3,179	2,454	2,302

ArcGIS remains the most used tool to work with data with 65% of mentions.

ENVI was next most used (43%) with Excel the choice of 30% and ERDAS/IMAGINE used by 31%.

Variety of programming languages used; About half interested in API

Respondent Information

	2010	2011	2012	2013
Preferred programming language				
C	--	--	9%	8%
C++	--	--	10%	12%
C#	--	--	1%	2%
Fortran 77	--	--	6%	4%
Fortran 90	--	--	17%	14%
Java	--	--	3%	6%
Perl	--	--	4%	4%
PHP	--	--	1%	0%
Python	--	--	11%	13%
Others	--	--	37%	37%
Number of Respondents			550	496

Interest in Application Programming Interfaces				
Interested in APIs	--	--	--	49%
Not interested	--	--	--	51%
Number of Respondents				2,798

Web service interested in~				
OGC	--	--	--	69%
OPeNDAP	--	--	--	18%
REST based web calls	--	--	--	22%
SOAP based web calls	--	--	--	16%
Remote Procedure Call	--	--	--	16%
Other	--	--	--	5%
Number of Respondents				1,361

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

A wide variety of languages were used by those who made their own tools with no language accounting for more than 14% (Fortran 90).

Those using software were nearly evenly split about APIs as 49% were interested in them.

OGC was the Web service with the most interest (69%).

Three-fourths sought documentation; product description most sought

Respondent Information

	2010	2011	2012	2013
Preferred method for web services				
Scripts	--	--	--	20%
Own Client	--	--	--	6%
Command Line	--	--	--	4%
Commercial Software Application	--	--	--	43%
Access from a Programming Language	--	--	--	24%
Other	--	--	--	2%
Number of Respondents				1,361

Looked for or got documentation				
Looked	72%	74%	69%	75%
Did not look	28%	26%	31%	25%
Number of Respondents	4,390	3,996	4,315	4,146

Documentation looked for~				
Data analysis tools	--	--	38%	49%
Data product description	79%	80%	66%	75%
Frequently Asked Questions	0%	0%	0%	27%
Instrument specifications	44%	43%	41%	32%
Product format	67%	68%	61%	57%
Production code	12%	10%	9%	12%
Science algorithm	50%	46%	45%	34%
Science applications	30%	29%	25%	27%
Search tools	--	--	12%	14%
Visualization tools	--	--	25%	28%
Other documentation	1%	2%	2%	2%
Number of Respondents	3,120	2,894	2,992	3,112

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

The most preferred method for web services among those interested in APIs was a Commercial Software Application (43%).

Three-fourths of all respondents looked for documentation.

Most sought documentation was data product description (75%).

Documentation accessed by multiple means; E-mail used for request

Respondent Information

	2010	2011	2012	2013
How accessed documentation~				
Data Center Website	--	--	--	68%
Dataset Metadata document	--	--	--	44%
Readme file	--	--	--	41%
Search and Order Interface	--	--	--	14%
Search Engine	--	--	--	40%
Not found	--	--	--	2%
Number of Respondents				3,112

Requested assistance from user services office during the past year				
Requested assistance	25%	24%	20%	17%
Have not requested assistance	75%	76%	80%	83%
Number of Respondents	4,390	3,996	4,315	4,146

Method of requesting assistance				
By phone	2%	2%	2%	2%
By e-mail	87%	80%	79%	76%
Both by phone and e-mail	11%	10%	10%	11%
In person at an event or conference	--	7%	9%	11%
Number of Respondents	1,094	976	861	698

-- Percents dashed due to questionnaire changes

~Multiple responses allowed

The Data Center Website was most used to access documentation (68%).

However, search engines, readme file and dataset metadata documents all accounted for at least 40%.

E-mail remains most used mode for requesting assistance.

About one-fourth of respondents from USA

Respondent Information

Just under one-fourth (24%) of respondents were from the USA.

9% of respondents were identified as having responded in both 2013 and 2012.

	2010	2011	2012	2013
Currently located - USA vs. All Others				
USA	27%	29%	25%	24%
All Others	73%	71%	75%	76%
Number of Respondents	4,390	3,996	4,315	4,146

Responded in 2012 and 2013				
Responded in 2012 and 2013	--	--	9%	9%
Did not respond in 2012 and 2013	--	--	91%	45%
Unknown-unauthenticated	--	--	0%	45%
Number of Respondents			4,315	4,146

-- Percents dashed due to questionnaire changes

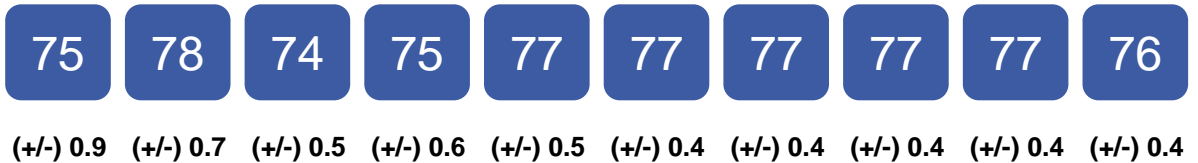
Overview Key Results

Satisfaction slips one point to 76 after holding at 77 since 2008

NASA EOSDIS Customer Satisfaction Trend

<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
n=1016	n=1263	n=2857	n=2291	n=2601	N=3842	n=4390	n=3996	n=4315	n=4146

ACSI



Overall satisfaction

How satisfied are you with the data products and services provided by [DAAC]?



Expectations

To what extent have data products and services provided by [DAAC] fallen short of or exceeded expectations?



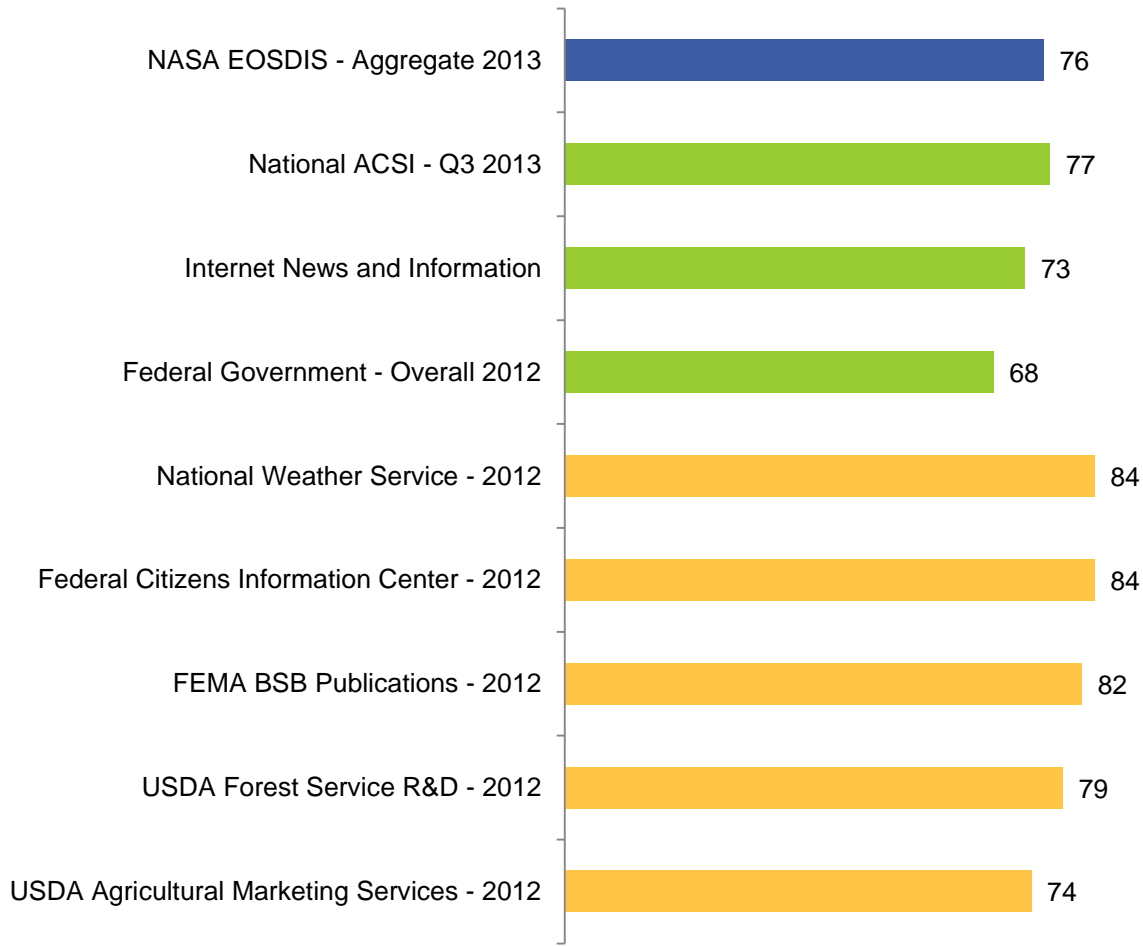
Ideal

How close does [DAAC] come to the ideal organization?



Information providers CSI range from mid 70s to mid 80s

Benchmarking



NASA EOSSDIS rates above the federal government average (68).

The CSI (76) for NASA is within the range of scores for government agencies that are data providers (74 to 84).

2013 NASA EOSDIS Satisfaction Model

NASA EOSDIS Customer Satisfaction Model



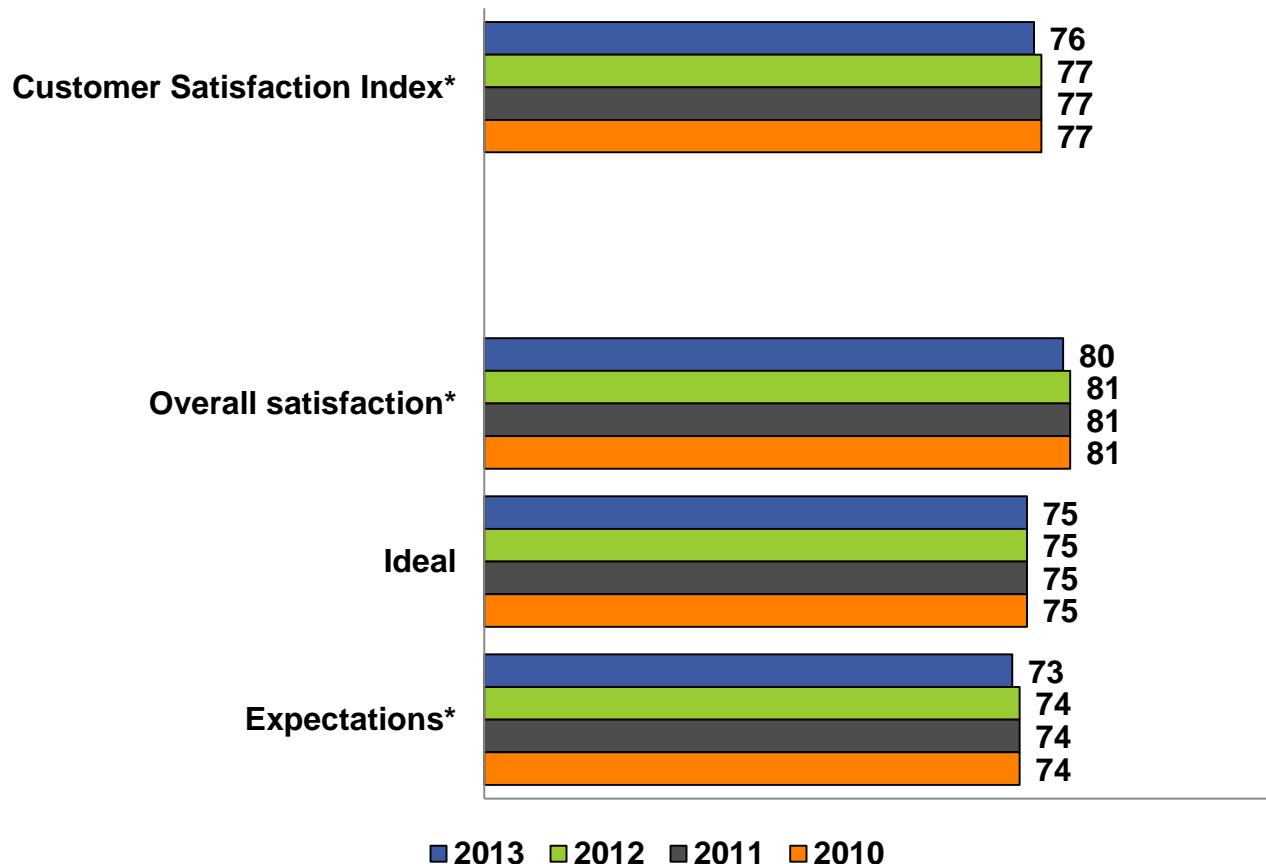
● The performance of each component on a 0 to 100 scale. Component scores are made up of the weighted average of the corresponding survey questions.

● The predicted change in CSI that results from a five point change in a component score.

● The predicted change in the Performance Outcome that results from a five point change in CSI.

Satisfaction slips one point in 2013

CSI & Component Scores



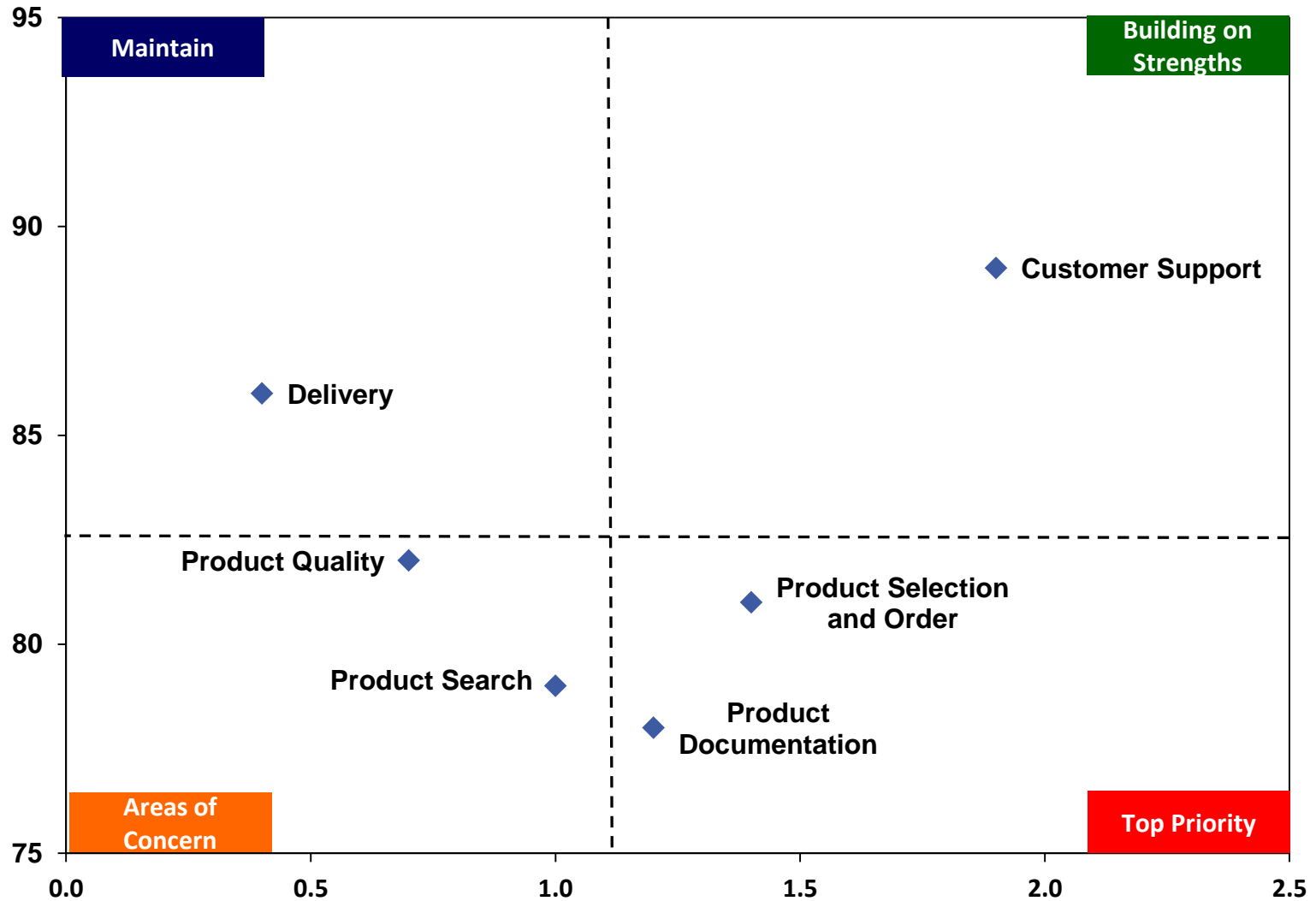
Satisfaction is down just one point in 2013.

Attributes overall satisfaction and satisfaction compared to expectations each drop one point.

* Significant difference at 90% confidence level

Product Selection and Order and Product Documentations top priorities

NASA EOSDIS Customer Satisfaction Model (n = 4,146)



Detailed Analysis

Despite higher Support ratings CSI only one point higher for USA

CSI & Component Scores by Location

	USA	All Others	Difference	Significant Difference
	Scores			
Sample Size	994	3,152		
Product Search	78	79	1	
Product Selection and Order	81	81	0	
Delivery	88	85	-3	*
Product Quality	81	82	1	
Product Documentation	77	78	1	
Customer Support	92	87	-5	*
Customer Satisfaction Index	77	76	-1	*
Likelihood to Recommend	87	85	-2	*
Likelihood to Use Services in Future	89	86	-3	*

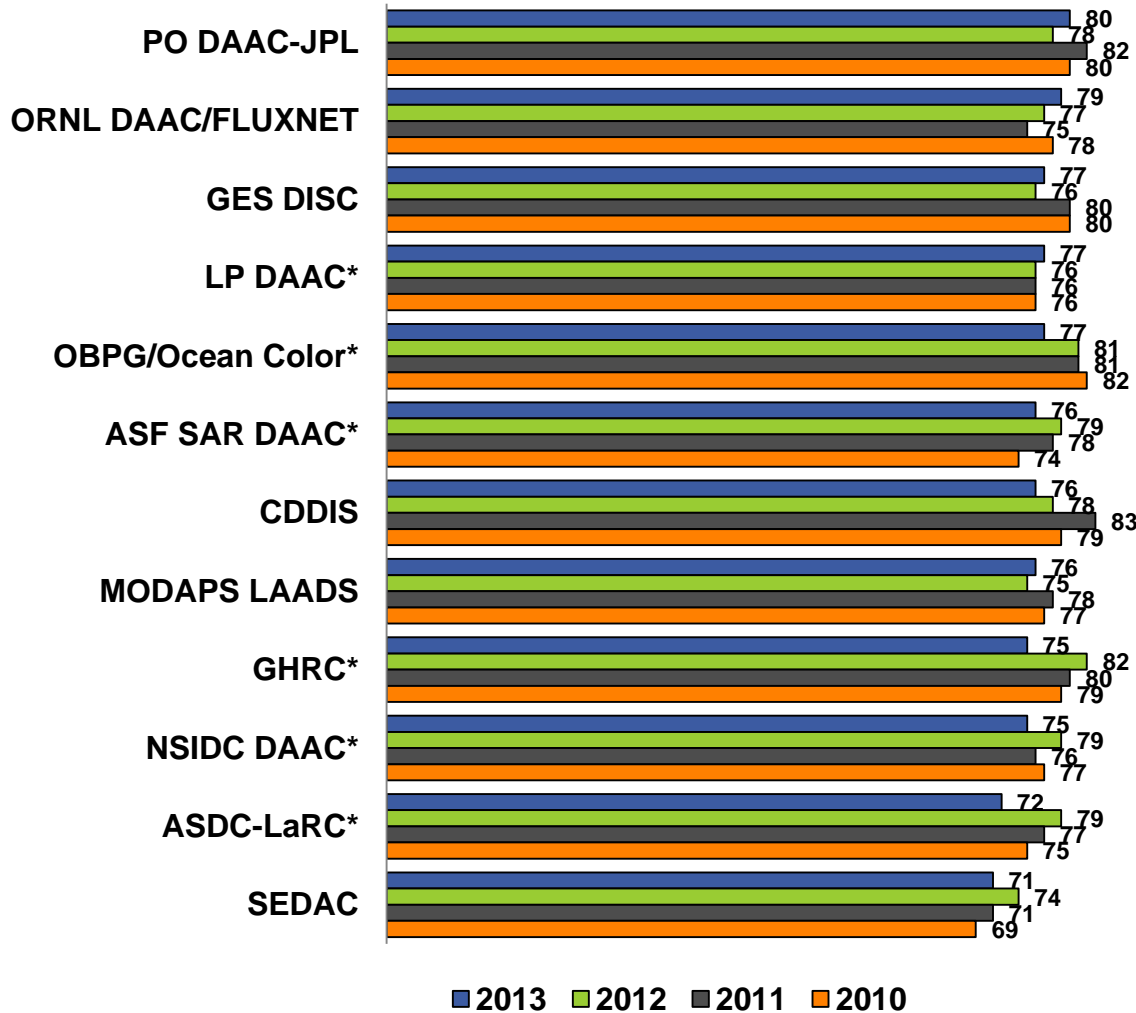
* Significant difference at 90% confidence level

Customer Support shows the greatest score difference between USA and non-USA respondents.

Satisfaction only differs by one point.

Most Data Centers CSI within a 2-point range

CSI by Data Center



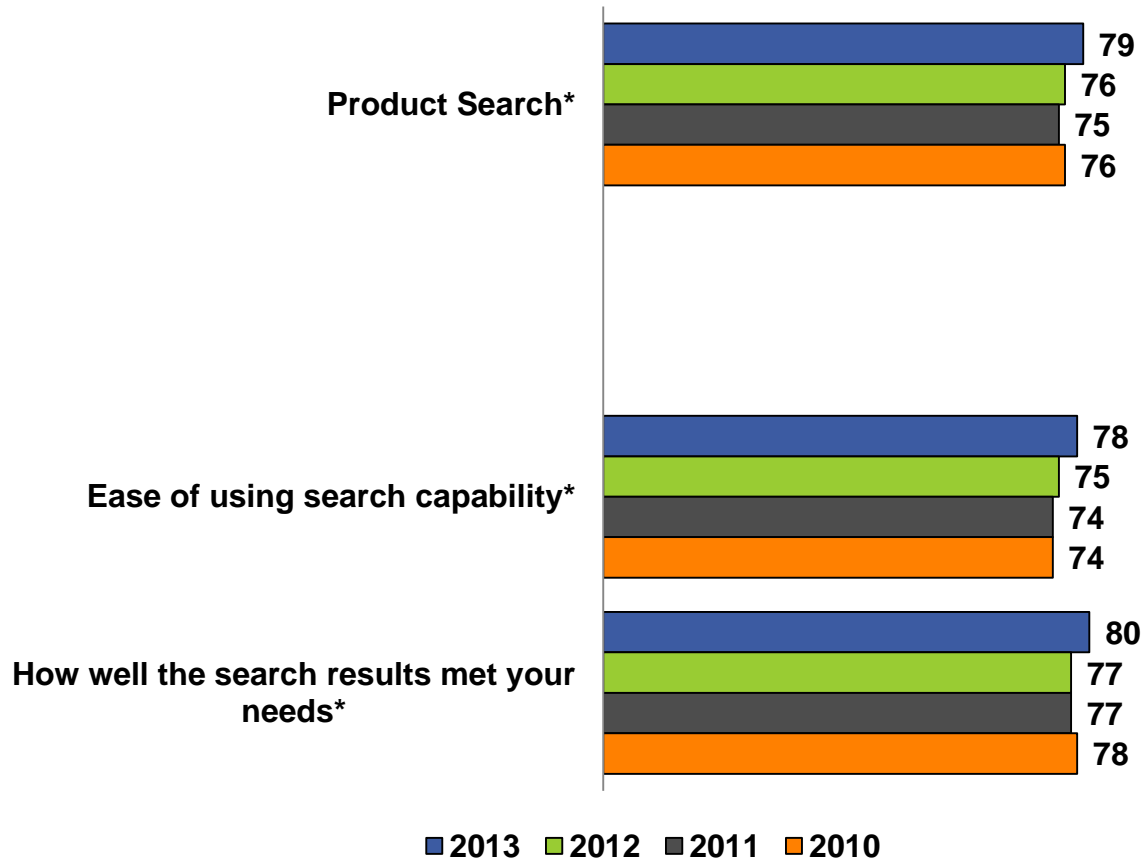
* Significant difference vs. 2012 at 90% confidence level

CSI does not vary by much for most data centers – 8 of 12 score between 75 and 77.

PO DAAC-JPL leads with CSI of 80, while SEDAC and ASDC-LaRC are in the low 70s.

Product Search improves three points

Component Detail - Product Search (Impact = 1.0)

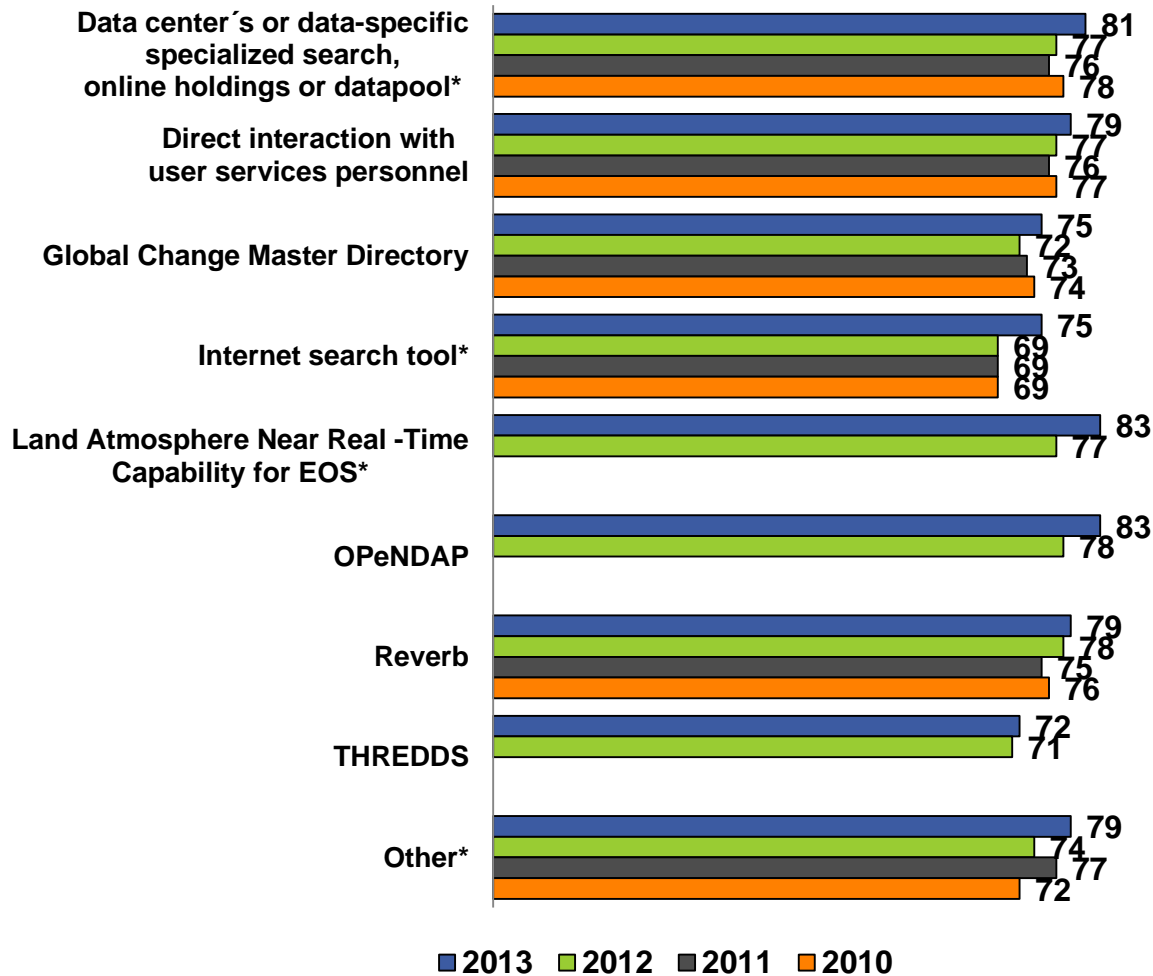


Product Search improves 3 points with both ease of using and results meeting needs up 3 points.

* Significant difference vs. 2012 at 90% confidence level

Most used search method rates among highest Product Search scores

Product Search Scores by Method of Search



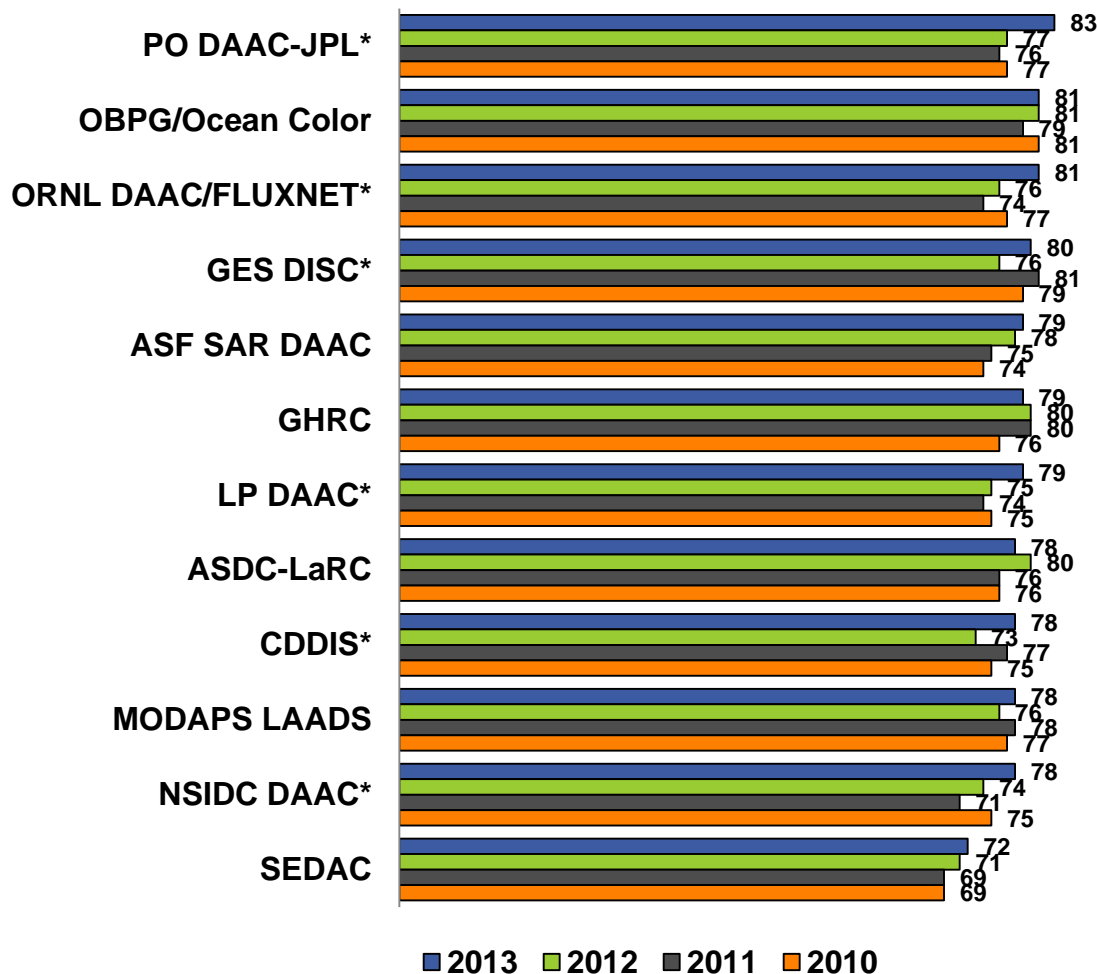
41% use data center's or data-specific specialized search. Product Search improved 4 points for this method.

21% use internet search tool, which improved a significant 6 points for its Product Search score.

* Significant difference vs. 2012 at 90% confidence level

Product Search score up significantly at six Data Centers

Product Search Scores by Data Center



* Significant difference vs. 2012 at 90% confidence level

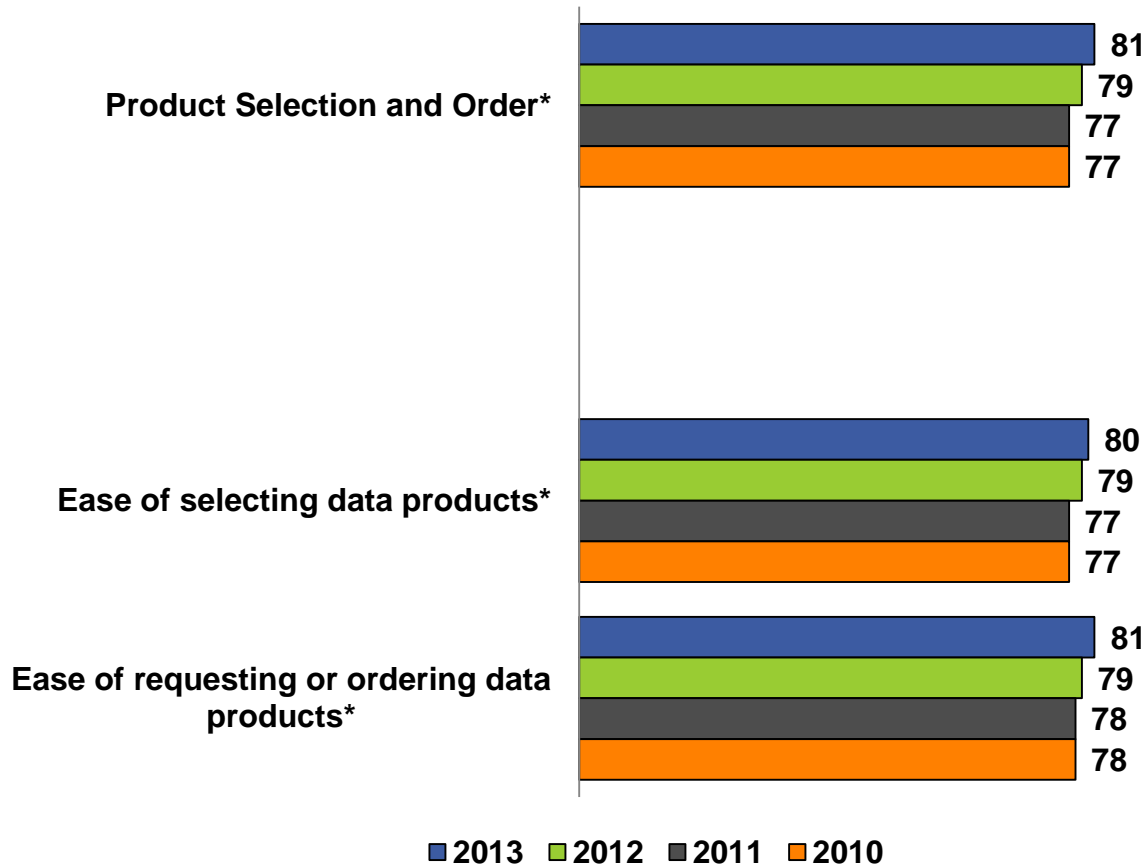
Product Search rates highest for PO DAAC-JPL (83).

Half of the Data Centers show a significant improvement in their Product Search score.

Score mostly range in the high 70s to low 80s.

High-impact area of Product Selection and Order up two points

Component Detail – Product Selection and Order (Impact = 1.4)



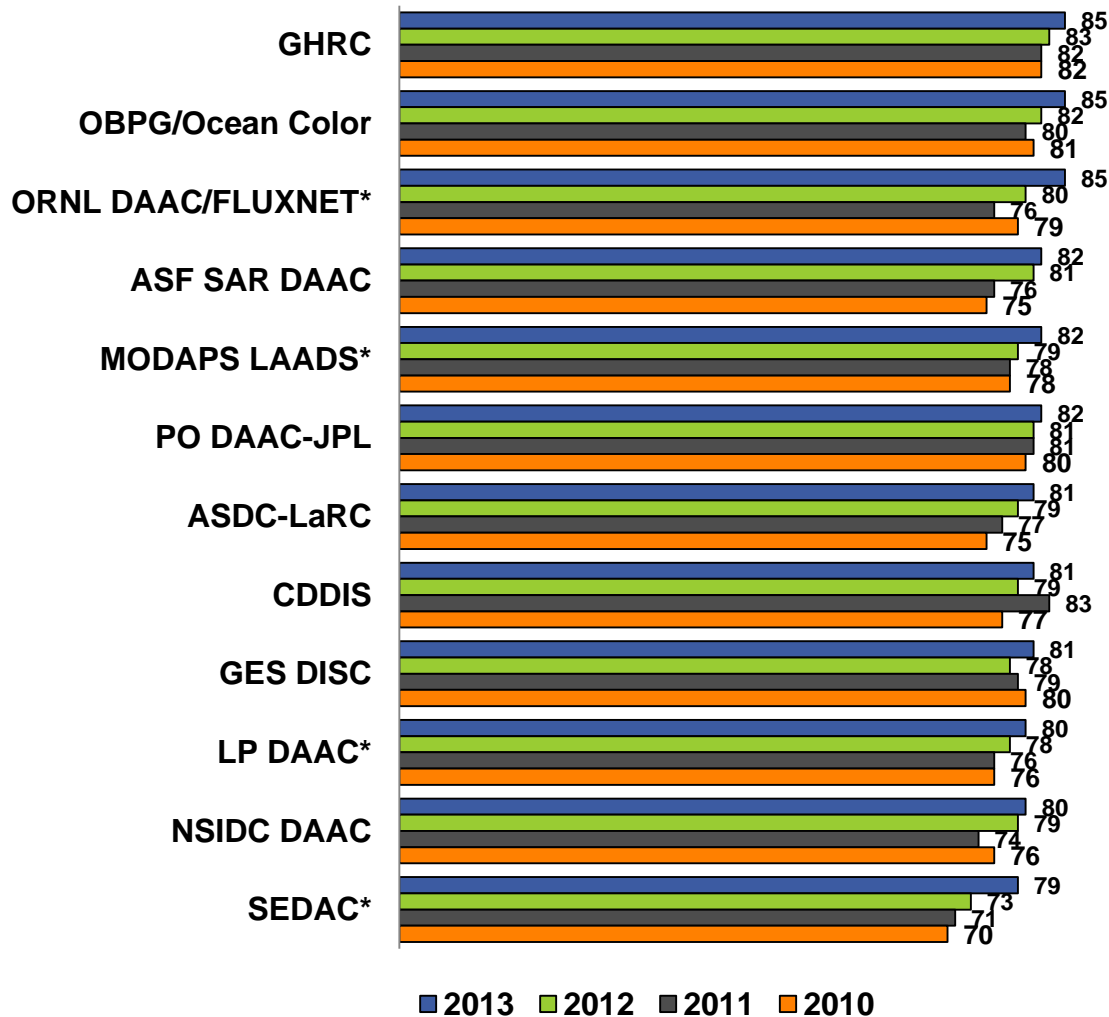
Product Selection and Order improves a significant 2 points.

Both attributes, ease of selecting and ease of requesting/ordering up significantly.

* Significant difference vs. 2012 at 90% confidence level

GHRC, OBPG/Ocean Color and ORNL DAAC/FLUXNET rate highest

Product Selection and Order Scores by Data Center



* Significant difference vs. 2012 at 90% confidence level

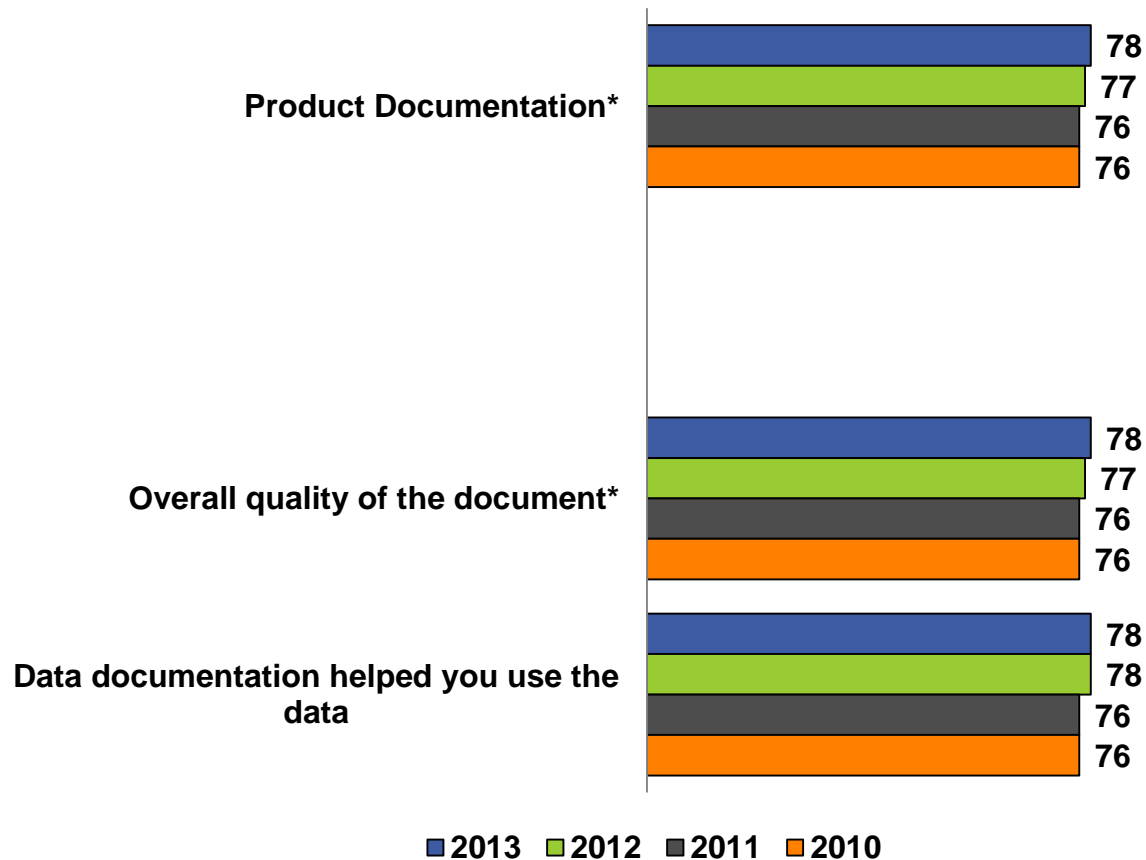
These three Data Centers rate 85 in the area of Product Selection and Order.

Four Data Centers realize significant improvements over last year.

Even lowest rated Data Center (SEDAC) has a significant 6-point gain.

Documentation edges up one point for a second consecutive year

Component Detail – Product Documentation (Impact = 1.2)



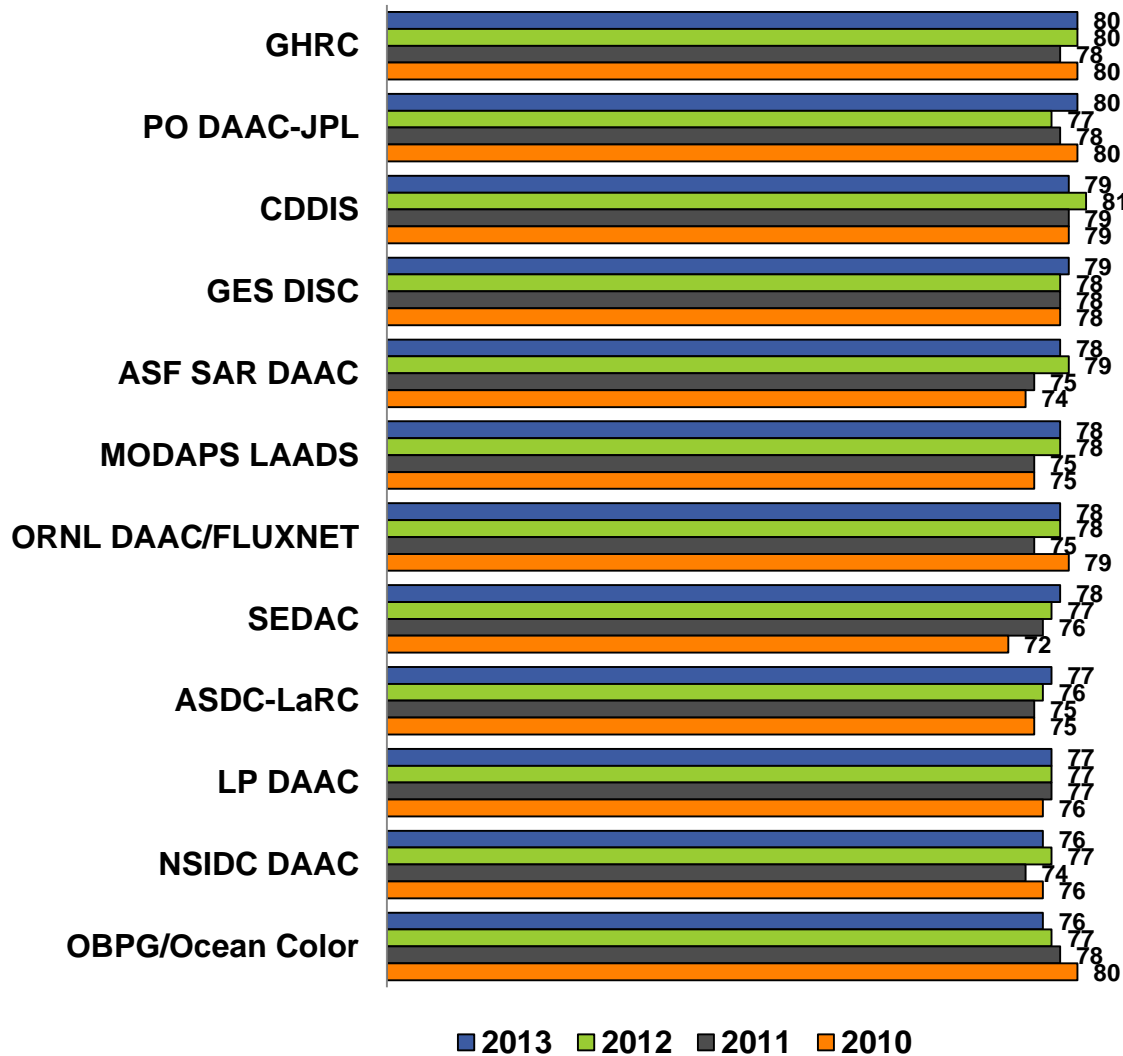
While trending up slightly, the higher-impact area of Documentation remains the lowest rated driver.

Overall quality of document improves one point.

* Significant difference vs. 2012 at 90% confidence level

Product Documentation scores hold across all Data Centers

Product Documentation Scores by Data Center



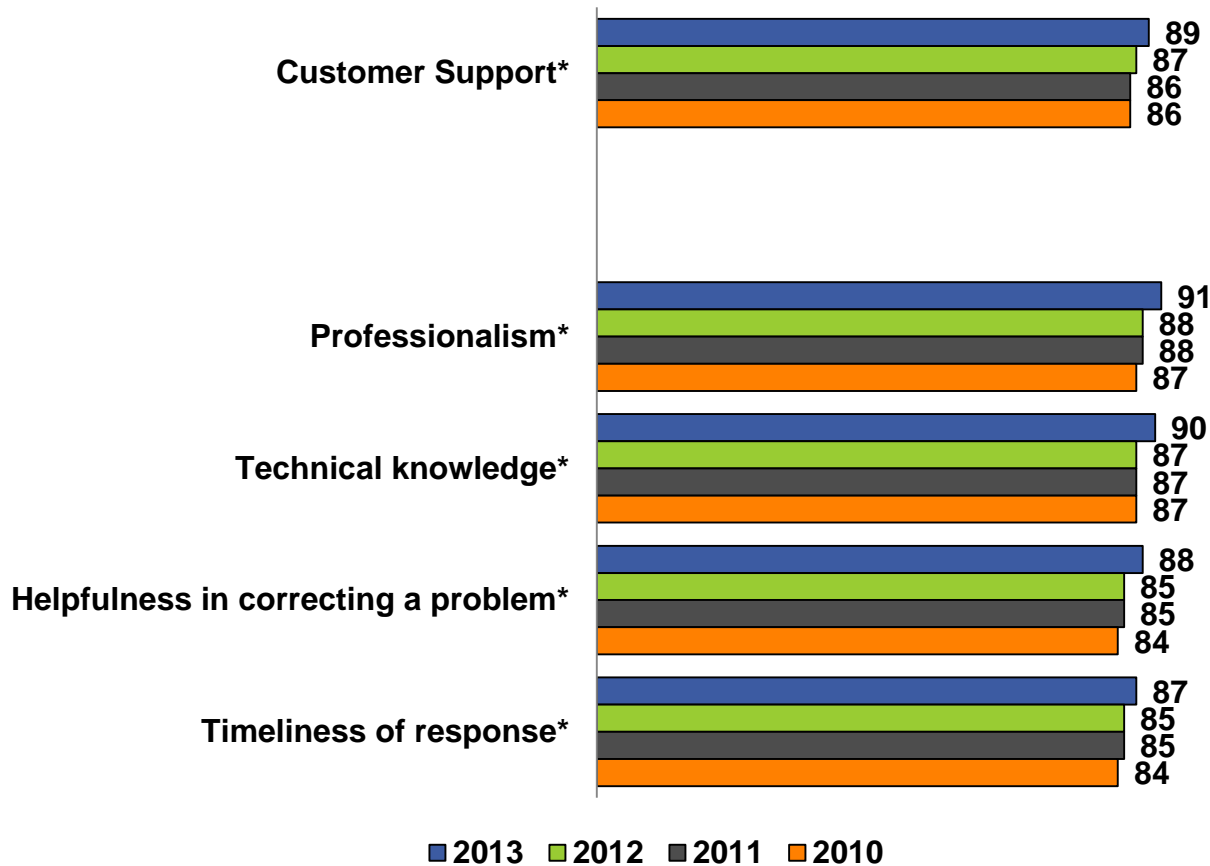
Only the top two Data Centers have scores of 80.

There were no significant changes in Product Documentation scores at any Data Center.

* Significant difference vs. 2012 at 90% confidence level

Customer Support recognized as a strength of NASA EOSDIS

Component Detail – Customer Support (Impact = 1.9)



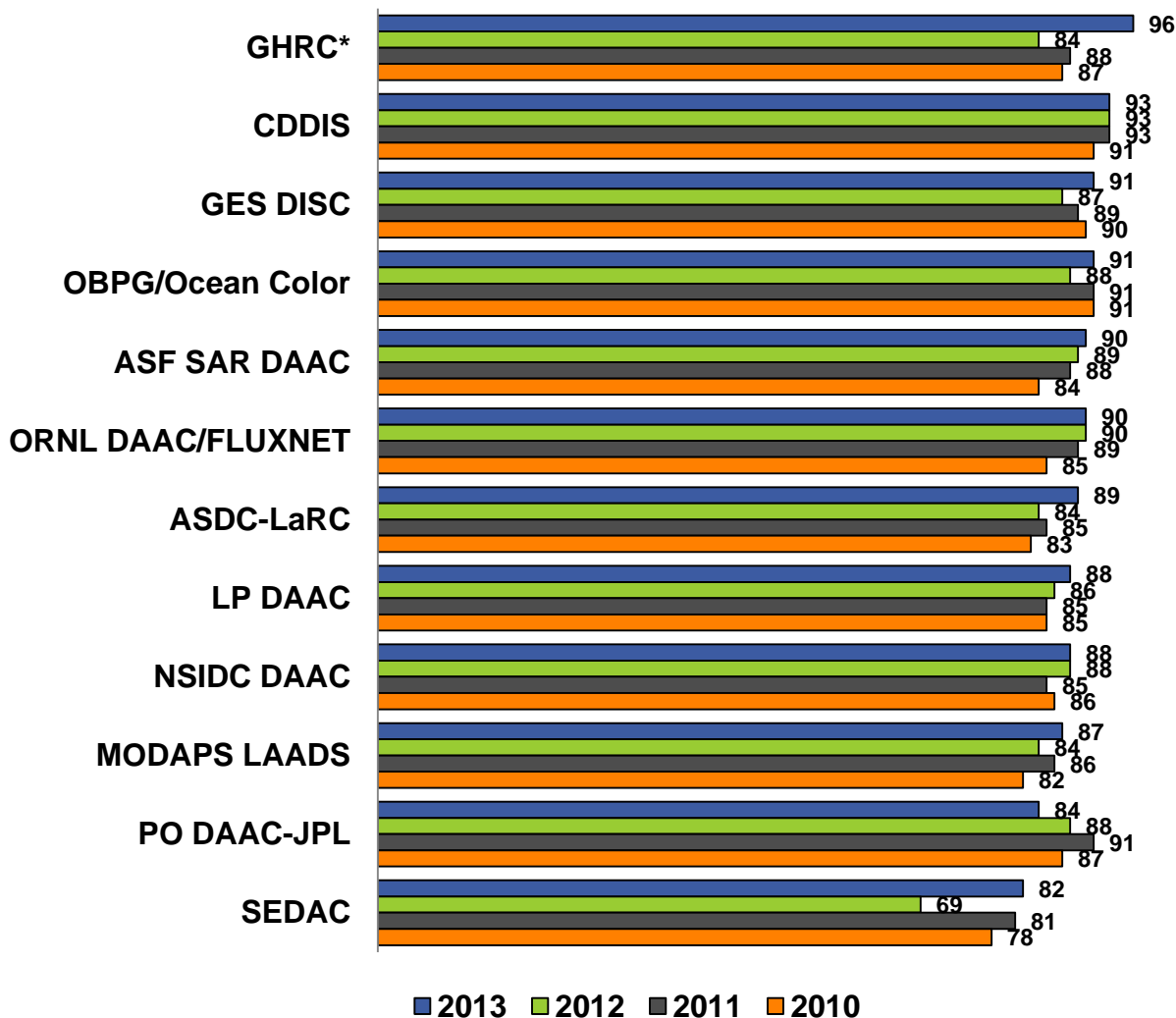
Customer Support has the highest impact on satisfaction and remains the highest rated driver.

All four attributes, professionalism, tech knowledge, helpfulness and timeliness see significant improvements over last year.

* Significant difference vs. 2012 at 90% confidence level

Data Centers providing excellent Customer Support

Customer Support Scores by Data Center



Most Data Centers rated in the high 80s to mid 90s for their Customer Support.

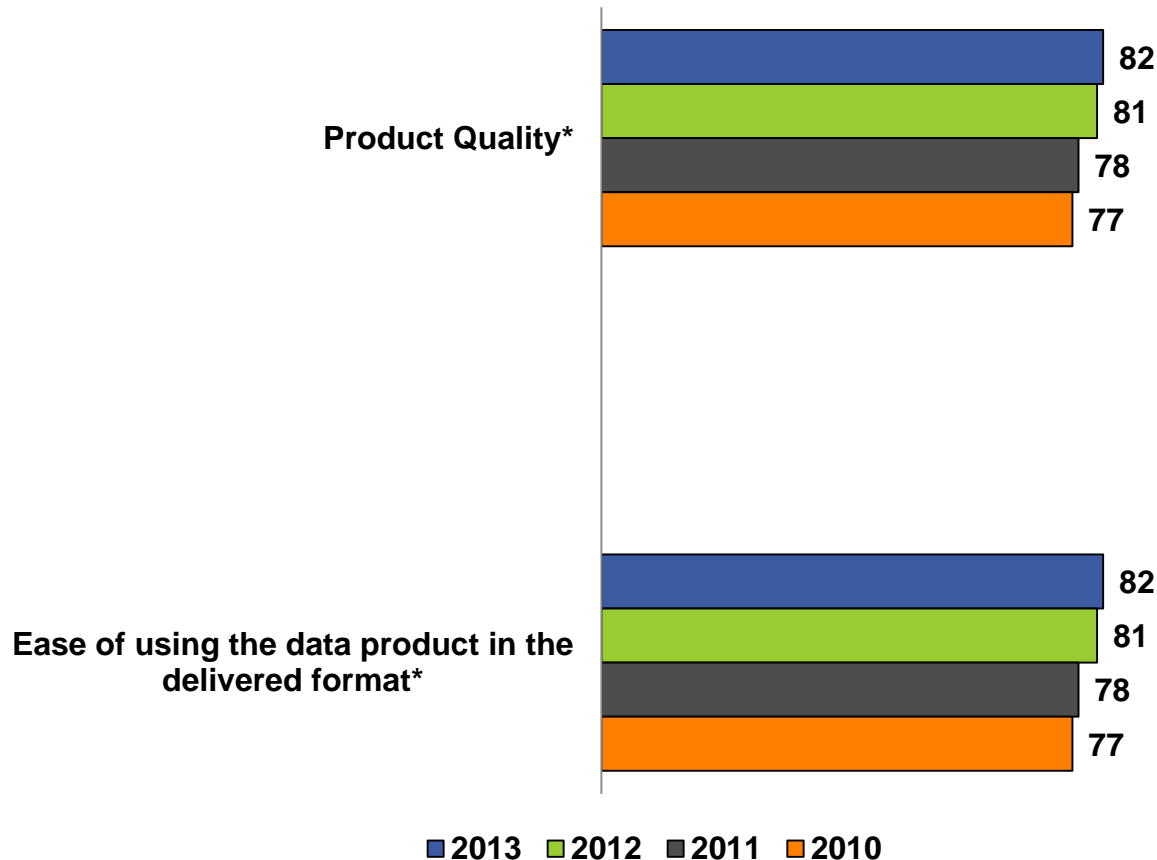
Only GHRC shows a significant gain from last year.

Lowest rated SEDAC also had a sizable gain of 13 points.

* Significant difference vs. 2012 at 90% confidence level

Ease of use continues to show improvement

Component Detail – Product Quality (Impact = 0.7)



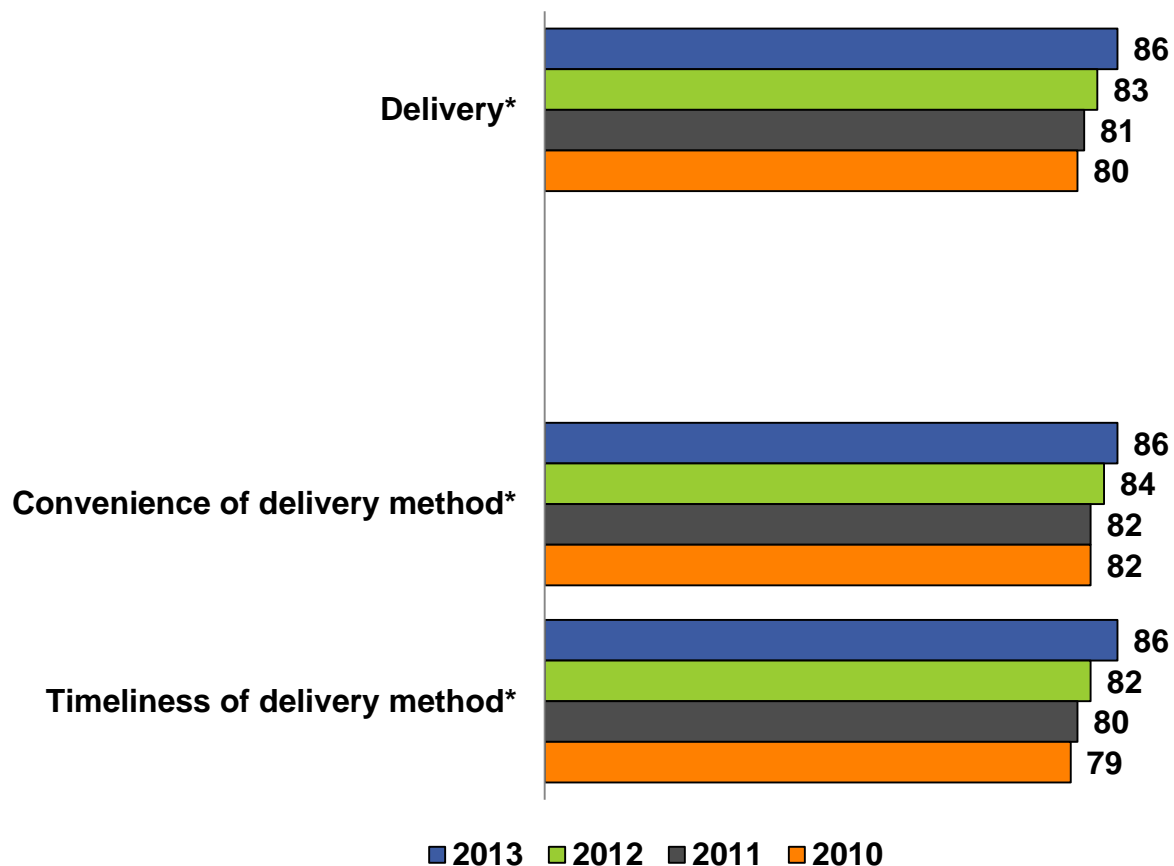
Quality, i.e., ease of using data product in delivered format continues to trend up.

Quality has gained 5 points since 2010.

* Significant difference vs. 2012 at 90% confidence level

Delivery of products both timely and convenient

Component Detail – Delivery (Impact = 0.4)



Lower-impact area of Delivery shows a significant three-point gain from last year.

Timeliness and convenience both have significant gains with timeliness up 4 points.

* Significant difference vs. 2012 at 90% confidence level

Summary and Recommendations

Summary and Recommendations

- **After five consecutive years at 77, Customer Satisfaction with NASA EOSDIS slips just one point to 76.**
- **No Data Center had a statistically significant increase in CSI from last year, although five centers did have slight increases of one or two points.**
 - > However, six centers had significant decreases in CSI from last year with the two biggest drops of 7 points occurring for GHRC and ASDC DAAC – LaRC.
- **Despite the slight slip in satisfaction, performance in driver areas is actually up slightly. All six satisfaction drivers increased at least one point from last year with the biggest increases in Product Search and Delivery – having 3-point gains.**
- **Customer Support remains the highest rated area. It provides users with strong technical knowledge and are very helpful in addressing customers' problems. They also respond in a very timely manner and overall are performing at a high level.**
 - > Usage is actually down slightly compared to previous years with 17% requesting assistance during the past year. As recently as 2011 nearly one-quarter (24%) had requested assistance.
 - > Maintaining the current level of support should be an objective of NASA.

Summary and Recommendations

- **Product Search showed a three-point improvement and is one of the key drivers of satisfaction.**
 - CDDIS, GES DISC, LP DAAC, NSIDC, ORNL DAAC/FLUXNET and PO DAAC all had significant improvements in score from last year. Whatever changes that may have been made during the past year seemed to have improved the users' perceptions of the ease of search.
 - Maintaining or building upon these improvements is recommended. Only SEDAC has a Product Search score in the low 70s; all other centers have scores in the high 70s to low 80s.
- **Product Selection and Order again showed a two-point increase and remains a key driver of satisfaction.**
 - LP DAAC, MODAPS/LAADS, ORNL DAAC /FLUXNET and SEDAC all had significant increases from last year. Selecting and ordering products is easy for users across all data centers.
 - The lowest rated center (SEDAC) still had a score of 79 in this area, which indicates that for users of all data centers the selection and ordering processes appear to be meeting their needs.
- **Most respondents (75%) looked for or received documentation. Product Documentation increased one point for a second year and has a high impact on satisfaction**
 - In particular, ensure that data product description, product format and data analysis tools documentation are useful to the customer. These are the types of information most sought.
 - No data center showed a significant increase in the rating of Product Documentation compared to last year. With scores only ranging from 76 to 80 across the 12 data centers, it appears that the documentation is useful, but there may be opportunities to improve the documents for users.
 - Encouraging customers to use documentation may be an opportunity to improve satisfaction and their experience using data. Customers who used documentation rated the driver areas Product Search, Product Selection and Order and Delivery higher and were more satisfied than those not using it.

Summary and Recommendations

- **Delivery improved three points (86) showing that users believe the product delivery is both very convenient and timely.**
 - > Two data centers (ASF and GHRC) are viewed as particularly excelling in their delivery with scores in the 90s. There was a positive trend across many data centers with ASF, GES DISC, GHRC, LP DAAC, MODAPS/LAADS and ORNL DAAC/FLUXNET all having significant improvements from last year.
 - > Given the relatively low impact that Delivery has on satisfaction, and positive trends in scores there is no need to address this area at this time.

Appendix

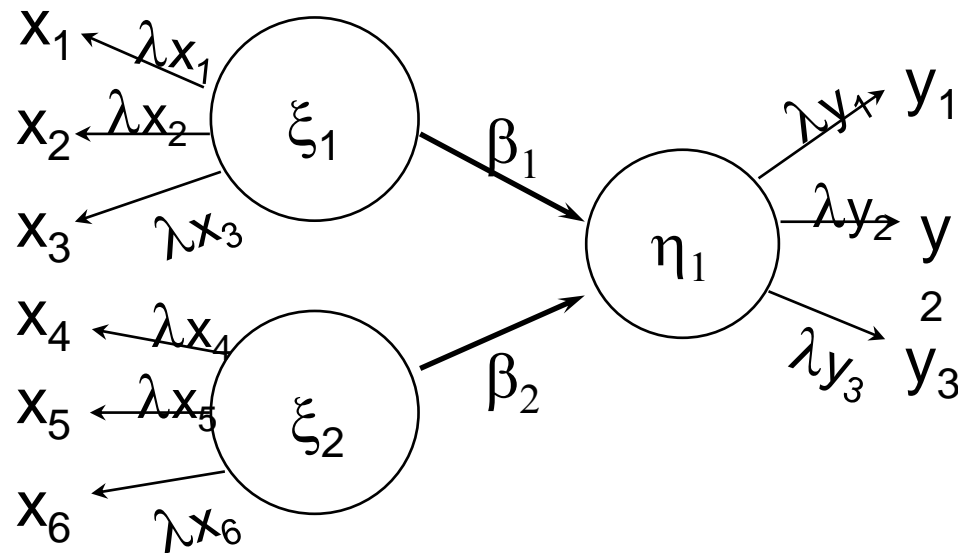
Satisfaction among repeat respondents holds above aggregate

Repeat respondents in 2012 and 2013

	2012	2013	Difference	Significant Difference
	Scores			
Sample Size	384	384		
Product Search	79	82	3	*
Ease of using search capability	78	81	3	*
How well the search results met your needs	80	82	2	*
Product Selection and Order	81	84	3	*
Ease of selecting data products	82	84	2	
Ease of requesting or ordering data products	82	83	1	
Delivery	86	88	2	*
Convenience of delivery method	87	89	2	
Timeliness of delivery method	85	88	3	*
Product Quality	83	83	0	
Ease of using the data product in the delivered format	83	83	0	
Product Documentation	80	79	-1	
Overall quality of the document	80	80	0	
Data documentation helped you use the data	79	79	0	
Customer Support	89	92	3	*
Professionalism	91	94	3	*
Technical knowledge	89	92	3	*
Helpfulness in correcting a problem	87	91	4	
Timeliness of response	87	90	3	
Customer Satisfaction Index	81	80	-1	
Overall satisfaction	85	83	-2	
Ideal	79	78	-1	
Expectations	77	77	0	
Likelihood to Recommend	90	89	-1	
Likelihood to recommend	90	89	-1	
Likelihood to Use Services in Future	91	91	0	
Likelihood to use services in future	91	91	0	

* Significant difference vs. 2012 at 90% confidence level

The Math Behind the Numbers



$$x_i = \lambda_{xi} \xi_t + \delta_i, \text{ for } i=1,2,3 \text{ } t=1,2$$

$$y_j = \lambda_{yj} \eta_1 + \varepsilon_j, \text{ for } j = 1,2,3$$

$$\eta_1 = \beta_1 \xi_1 + \beta_2 \xi_2 + \zeta_1$$

A discussion for a later date...or following this presentation for those who are interested.

A Note About Score Calculation

- Attributes (questions on the survey) are typically answered on a 1-10 scale
 - > Social science research shows 7-10 response categories are optimal
 - > Customers are familiar with a 10 point scale
- Before being reported, scores are transformed from a 1-10 to a 0-100 scale
 - > The transformation is strictly algebraic; e.g.

Orig. (1-10)	Trans. (0-100)
1	0
2	11.1
3	22.2
8	77.8
9	88.9
10	100

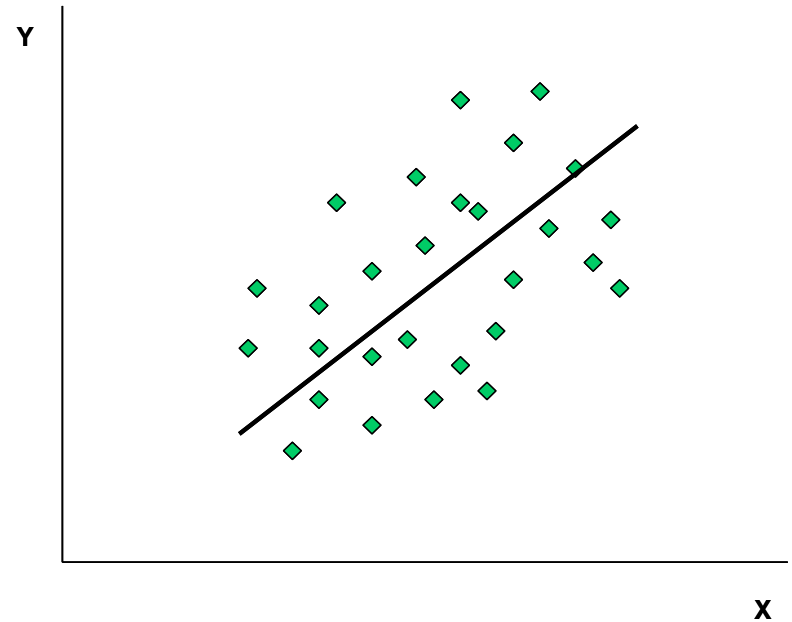
- > The 0-100 scale simplifies reporting:
 - Often no need to report many, if any, decimal places
 - 0-100 scale is useful as a management tool

Deriving Impacts

- Remember high school algebra?
The general formula for a line is:

$$y = mx + b$$

- The basic idea is that x is a “cause” and y is an “effect”, and m represents the slope of the line – *summarizing the relationship between x & y*



- CFI Group uses a sophisticated variation of the advanced statistical tool, Partial Least Squares (PLS) Regression, to determine impacts when many difference causes (i.e., quality components) simultaneously effect an outcome (e.g., Customer Satisfaction)

Thank you

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