Stratospheric Ozone and NDACC

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Outline

- Projects
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- Challenges creating data sets
- Approach
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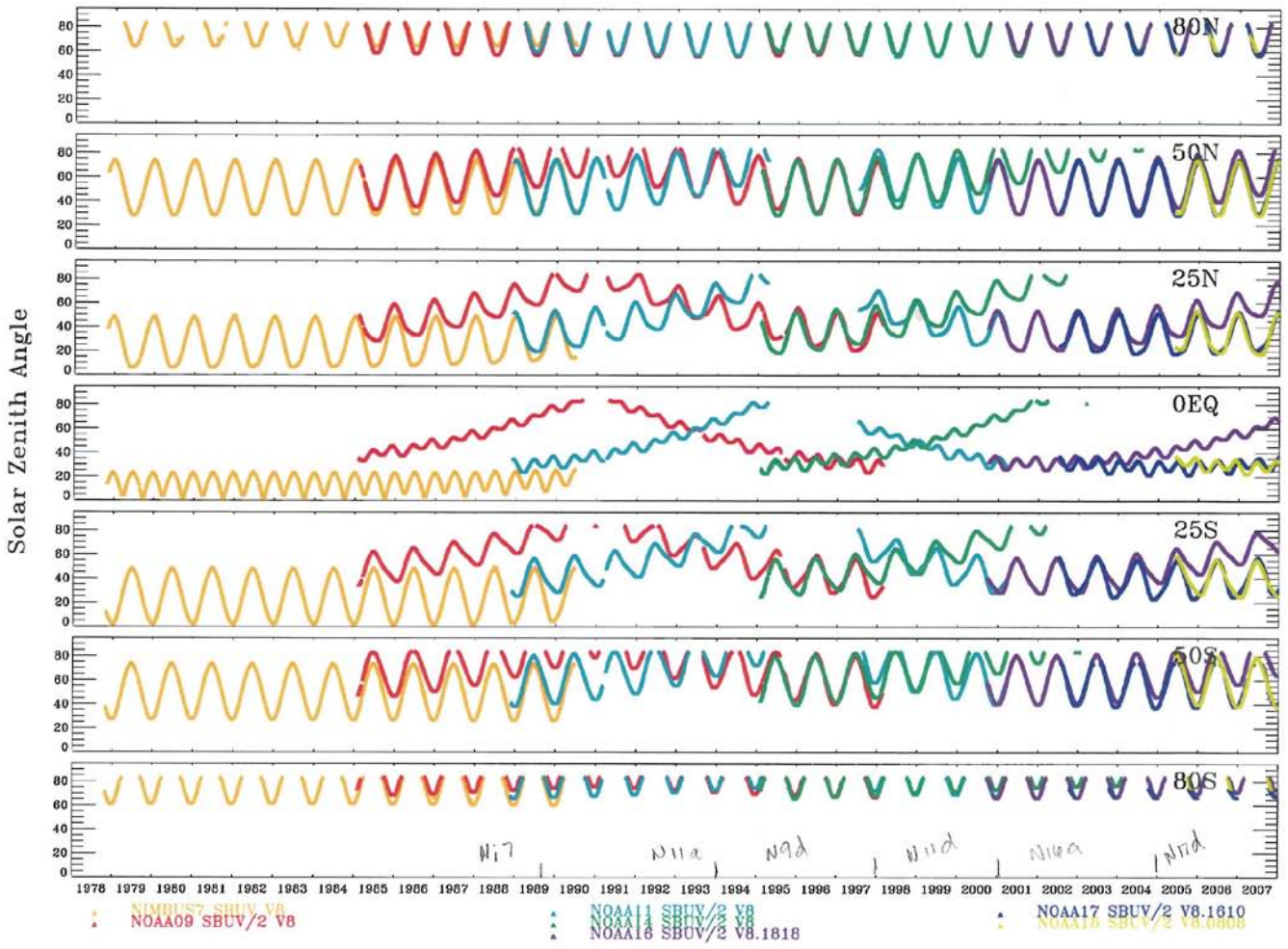
Overview

- **Projects:**
  - **Cohesive SBUV(/2) Total and Profile Ozone data set**
  - **Data Host Facility for the NDACC**
    - **Network for Detection of Atmospheric Composition Change**
- **Goals:**
  - **Create/maintain a trend quality data set for total and profile ozone using the SBUV(/2) instrument for use by the scientific community to research variability of ozone on multiple climate scales**
  - **Provide convenient/reliable/secure means for NDACC Scientists to ingest their observations and convenient/ reliable means for researchers to access this data.**

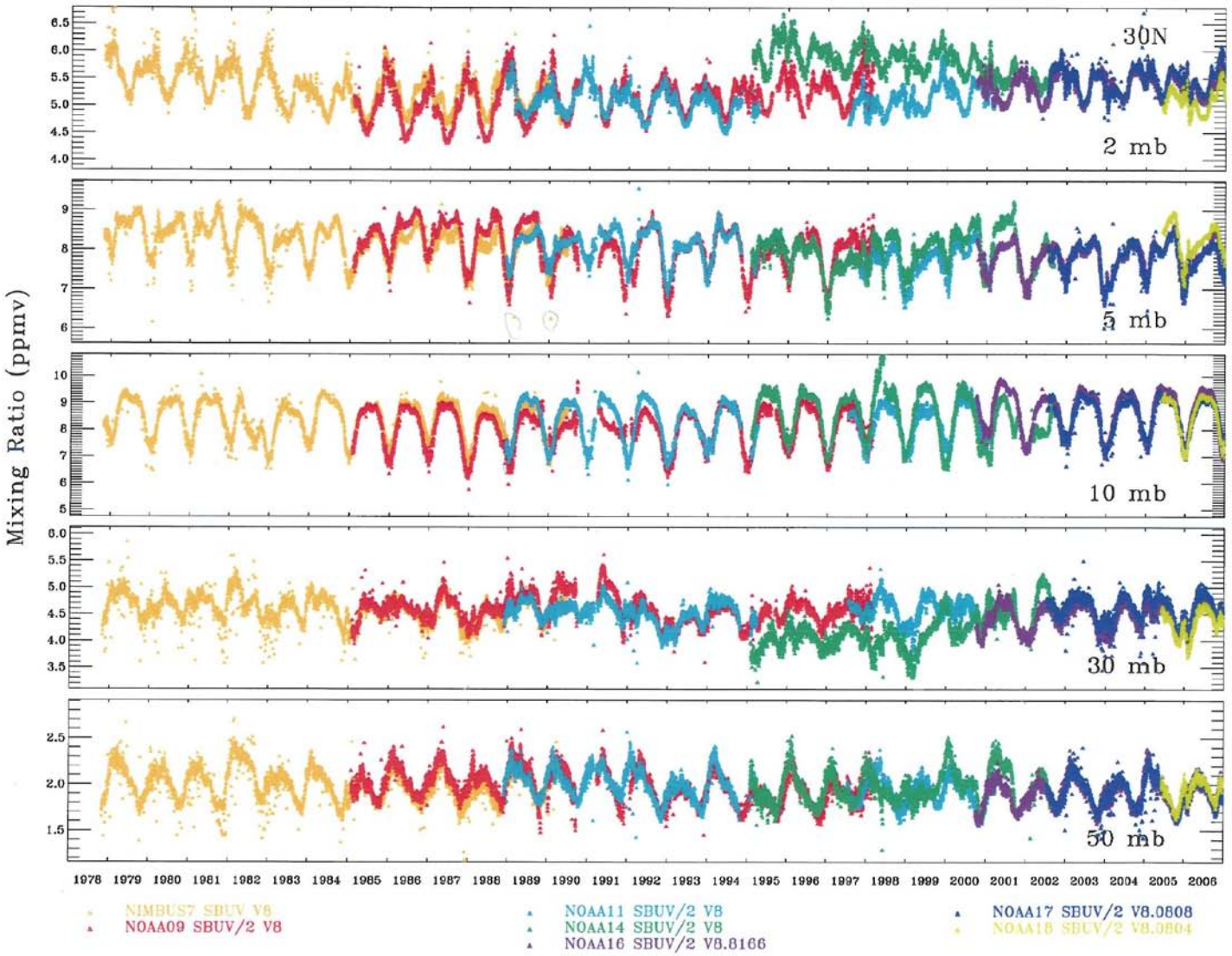
Overview

- **Source Data:**
  - **SBUV and SBUV/2 V8 data from level 2 PMF files**
  - **NDACC observers provide data from:**
    - **radiosonde, microwave, lidar, UV/Vis, UV spectral, FTIR, and Dobson/Brewer**
- **Deliverables:**
  - **Data set of bias adjusted zonal monthly mean total ozone and profile ozone mixing ratios from 1979 to present and into the future.**
- **User communities:**
  - **Ozone depletion/recovery**
  - **Climate Change & Variability**
  - **Air Quality**

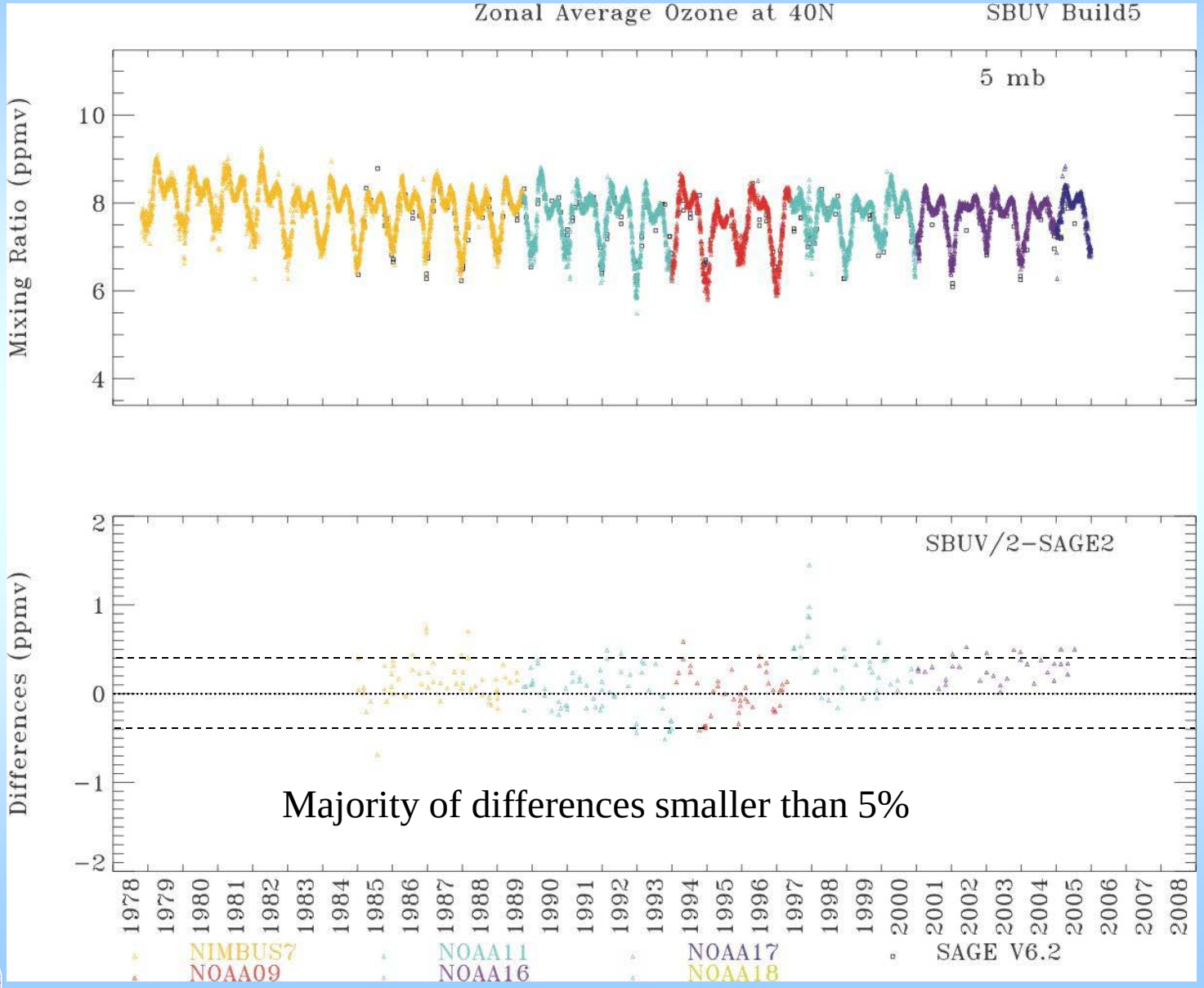
The Challenge: Multiple satellites that drift with time



Examples of Unadjusted SBUV/2 profile data sets

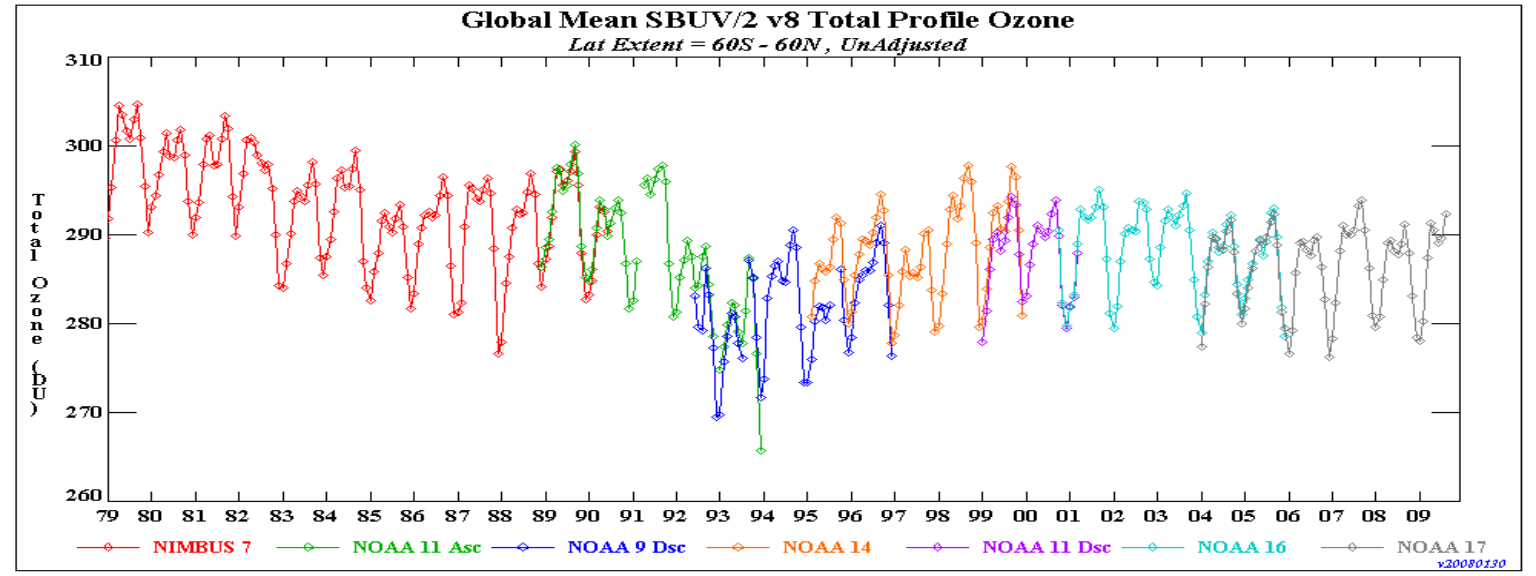


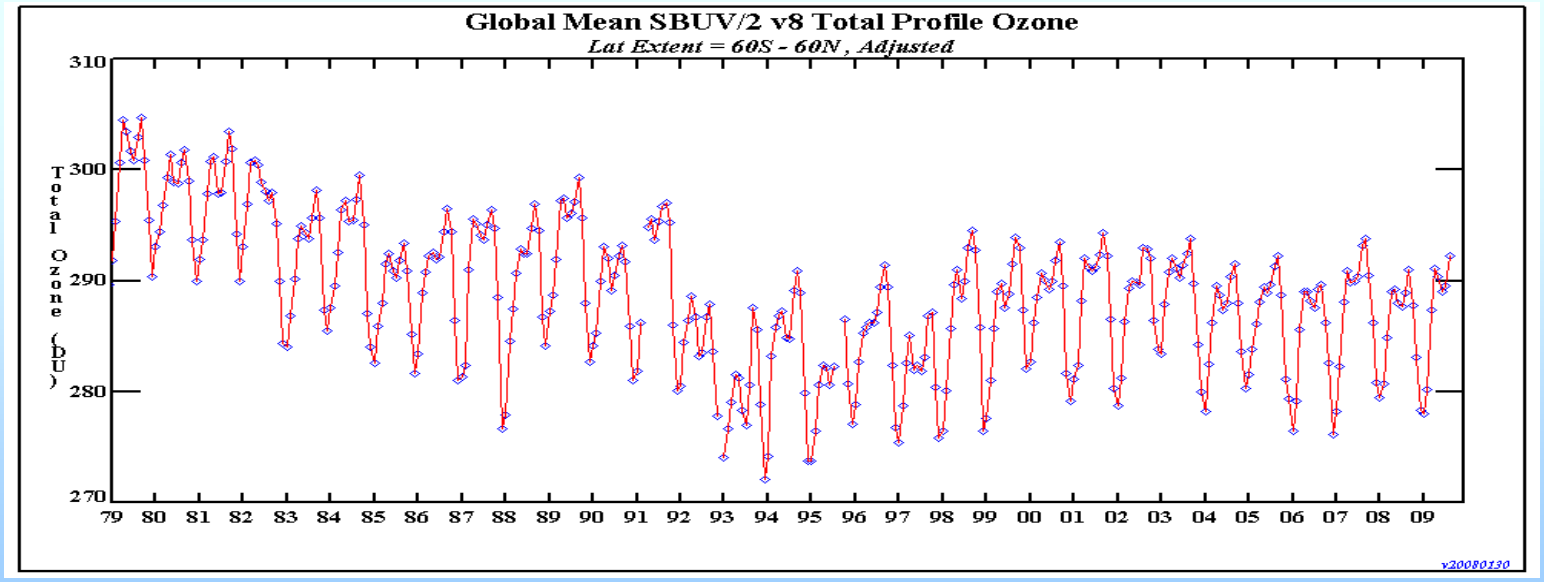
Adjusted Profile Data Set and Differences from SAGE II



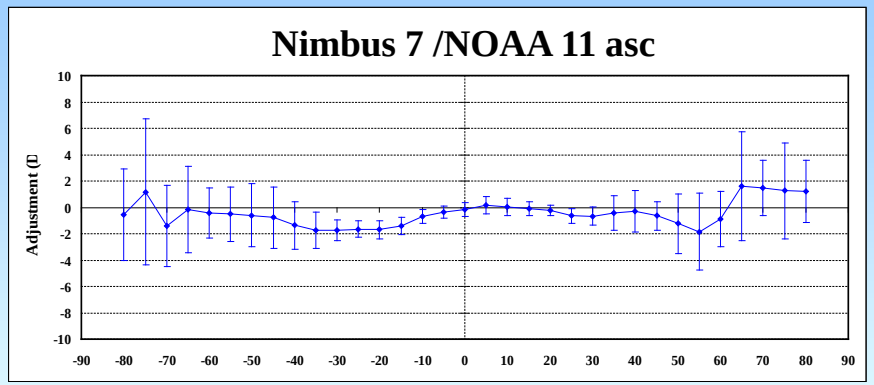
Majority of differences smaller than 5%

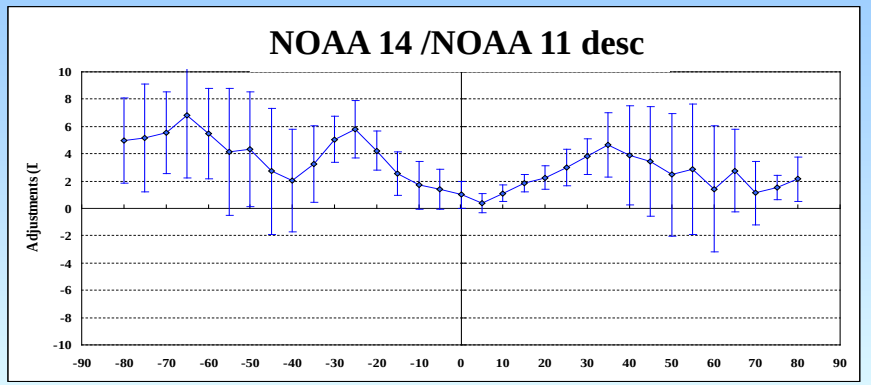
Similar Situation for Total Ozone Data Set

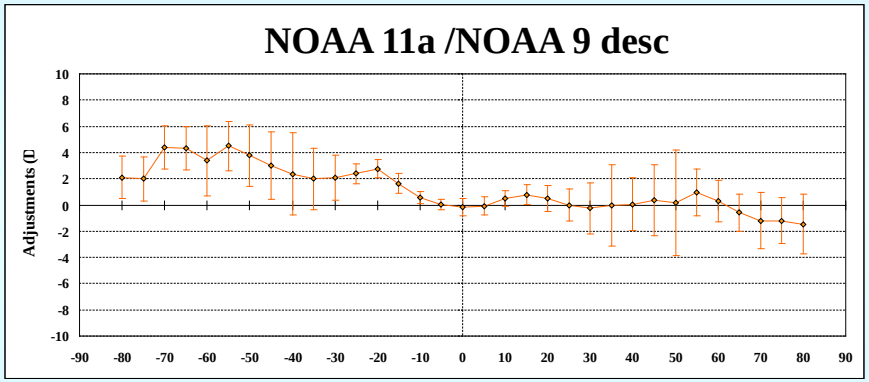


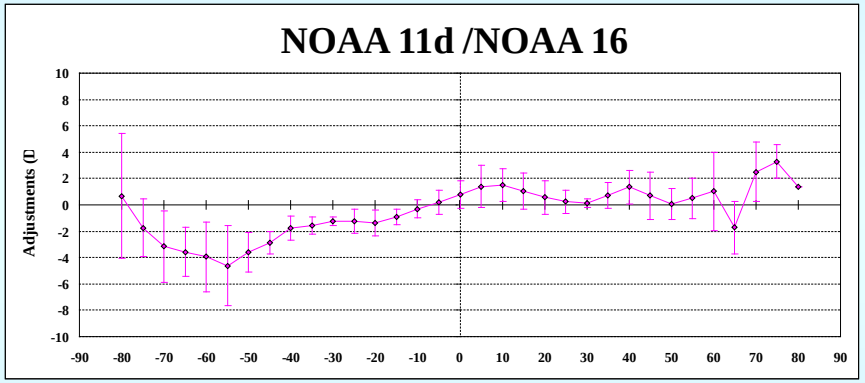


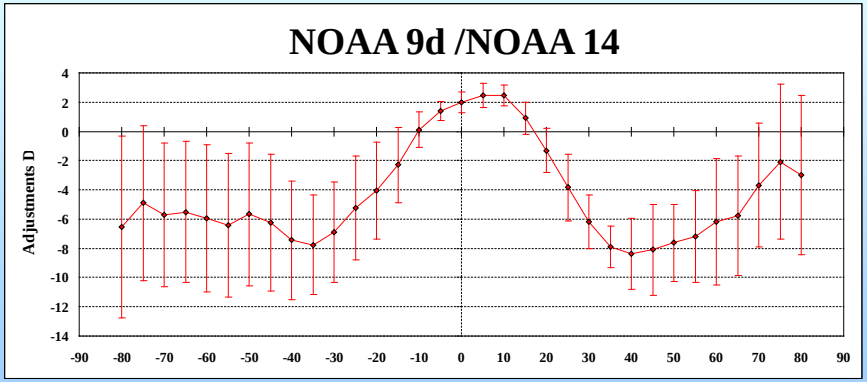
Overlap Adjustments Between Consecutive Satellites

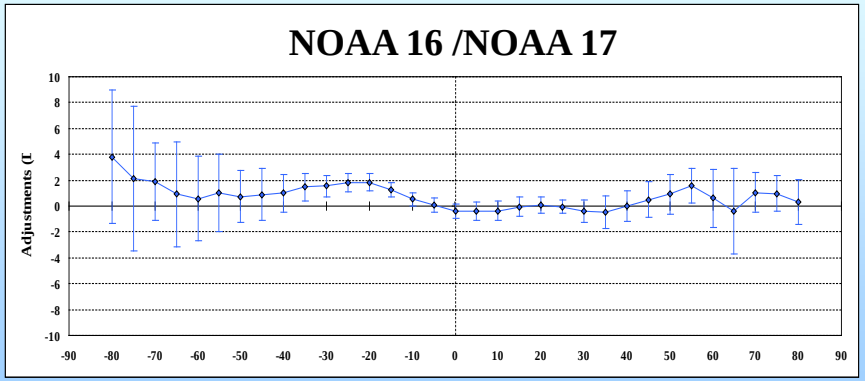






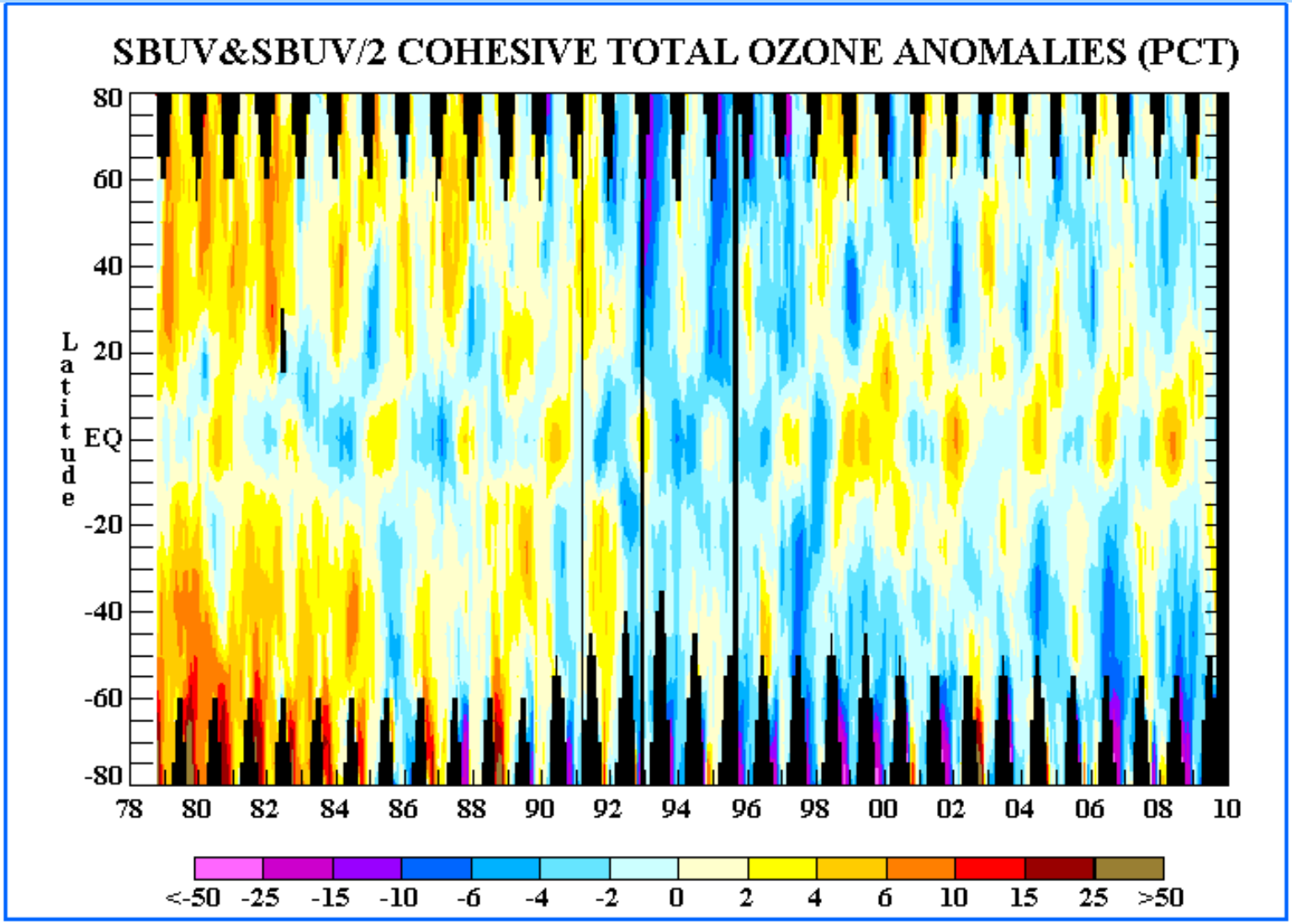




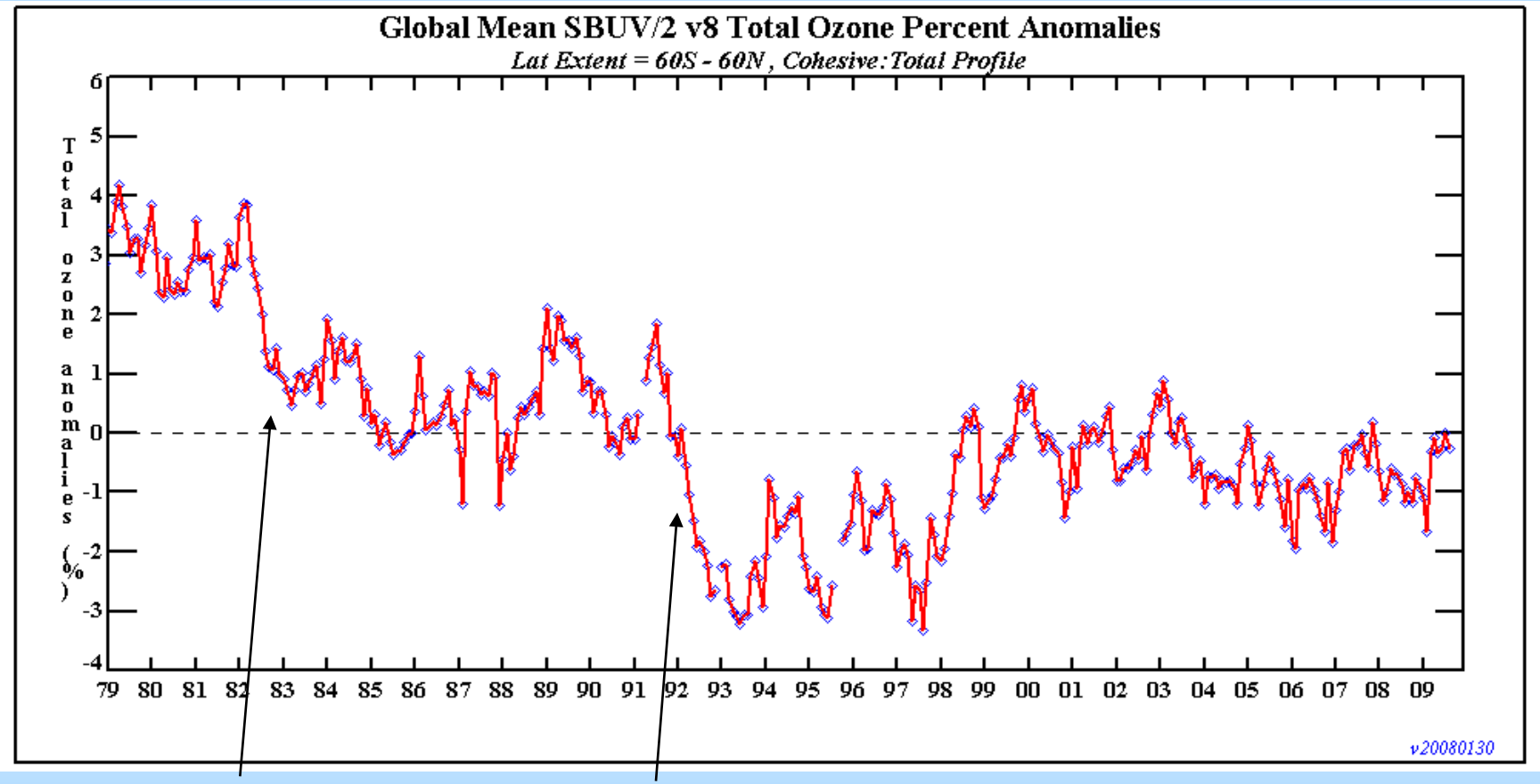


Overlaps range from 4 months to 2 years

Results


SBUV&SBUV/2 COHESIVE TOTAL OZONE ANOMALIES (PCT)
Latitude
80
60
40
20
EQ
-20
-40
-60
-80
78
80
82
84
86
88
90
92
94
96
98
00
02
04
06
08
10
<-50
-25
-15
-10
-6
-4
-2
0
2
4
6
10
15
25
>50

Results

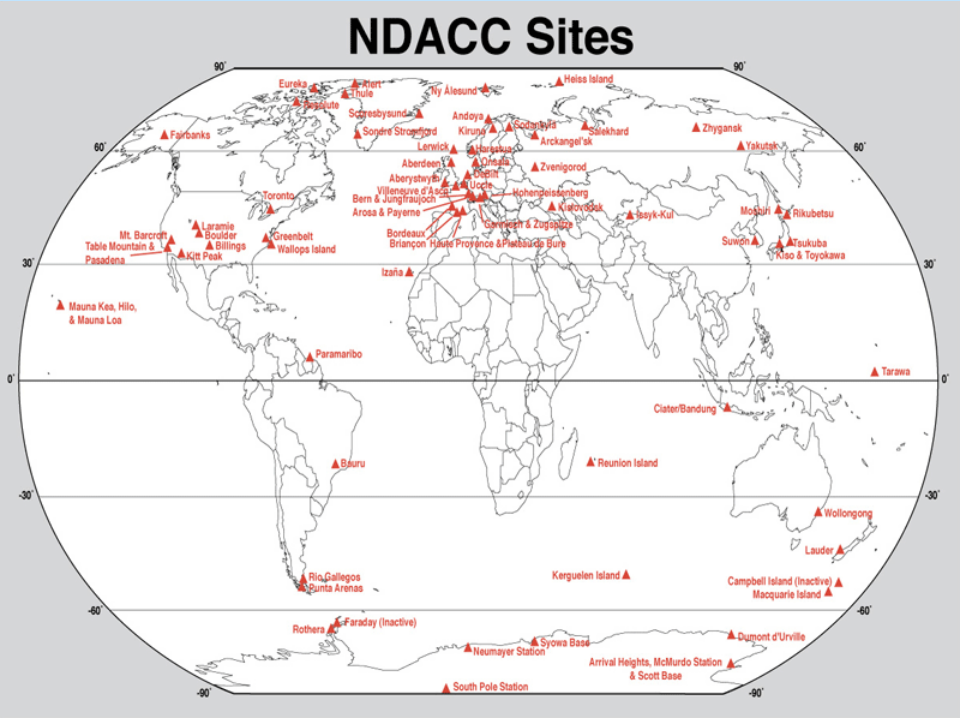


El Chicon

Pinatubo

NDACC

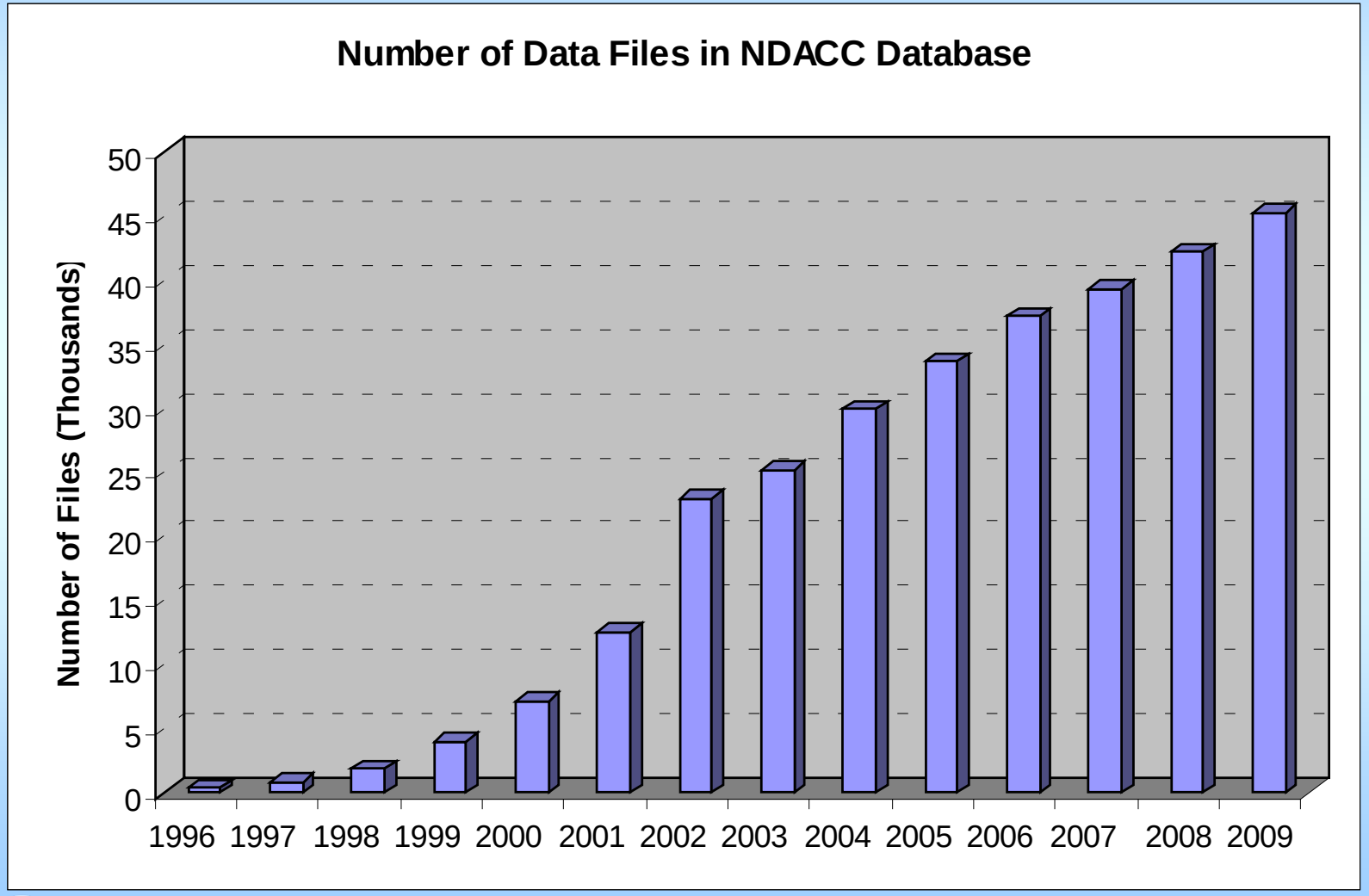
- Collection of highest quality observations suitable for trend detection
- Established in mid 1990s
- Over 70 Sites
- DHF has strong relationship w/ scientists submitting data.
- Collaborating with other international data facilities to make data even more accessible.



NDACC

- **Goals of NDACC**
  - **Detecting trends in overall atmospheric composition and understanding their impacts on the stratosphere and troposphere,**
  - **Studying atmospheric composition variability at various time scales,**
  - **Establish links and feedbacks between climate change and atmos composition,**
  - **Calibrating and validating space-based measurements of the atmosphere,**
  - **Supporting process-focused scientific field campaigns, and**
  - **Testing and improving theoretical models of the atmosphere.**

Number of files contained in NDACC DHF



SBUV/2 Cohesive Total and Profile Product Maturity

Maturity	Sensor Use	Algorithm stability	Metadata & QA	Documentation	Validation	Public Release	Science & Applications
1	Research Mission	Significant changes likely	Incomplete	Draft ATBD	Minimal	Limited data availability to develop familiarity	Little or none
2	Research Mission	Some changes expected	Research grade (extensive)	ATBD Version 1+	Uncertainty estimated for select locations/times	Data available but of unknown accuracy; caveats required for use.	Limited or ongoing
3	Research Missions	Minimal changes expected	Research grade (extensive); Meets international standards	Public ATBD; Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
4	Operational Mission	Minimal changes expected	Stable, Allows provenance tracking and reproducibility; Meets international standards	Public ATBD; Draft Operational Algorithm Description (OAD); Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
5	All relevant research and operational missions; unified and coherent record demonstrated across different sensors	Stable and reproducible	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Public ATBD, Operational Algorithm Description (OAD) and Validation Plan; Peer-reviewed algorithm, product and validation articles	Consistent uncertainties estimated over most environmental conditions by multiple investigators	Multi-mission record is publicly available with associated uncertainty estimate	Used in various published applications and assessments by different investigators
6	All relevant research and operational missions; unified and coherent record over complete series; record is considered scientifically irrefutable following extensive	Stable and reproducible; homogeneous and published error budget	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Product, algorithm, validation, processing and metadata described in peer-reviewed literature	Observation strategy designed to reveal systematic errors through independent cross-checks, open inspection, and continuous interrogation	Multi-mission record is publicly available from Long-Term archive	Used in various published applications and assessments by different investigators

Issues:

- **Ozone Data Set**
  - **"Living" data set**
    - **intend to extend using OMPS data**
  - **Need to redetermine adjustments with each new calibration change and version**
    - **Version 9 coming in 2010**
  - **Need to do better job validating and publishing data set.**
  - **Shared with Vitali Fioletov**
    - **editor WMO Quadrennial Assessment**
  - **Keep at CPC**

Issues:

- **NDACC Data Host Facility**
  - Input/Output/Query of DHF is working well.
  - Duplication/Backup procedures are working well
  - Data sets are screened before being put into DHF
    - Gets hectic several weeks before big meetings
  - Push to convert to HDF has been tabled.
  - PC holding data set is old and needs to be replaced. (rack mounted – NCO requirement)
  - Keep at CPC

Resources

- **Personnel :**
  - ½ time Contractor – all NDACC
  - 3/5 time Contractor – split evenly between NDACC and Ozone
- **Equipment:**
  - Dell PC w/700Gb storage for NDACC
    - Will be upgraded in FY10 for rack mounting for NCEP/NCO
- **Collaborators:**
  - Ozone: Larry Flynn, NESDIS/STAR & Donna McNamarra, NESDIS/OSDPD
  - Vitali Fioletov, EC & Don Wuebbles, UIUC
  - Ozone: GPO/ACCP also provides funding
  - NDACC: NASA and NDACC Steering Committee
- **NOAA Data Center: CPC**

Concluding Remarks

- **Cohesive Ozone data sets and NDACC DHF provide quality data for studies of the variability of the atmosphere over multiple time scales.**
  - **Seasons -> Years -> Decades**
- **Fits within CPC's mission to provide inter-seasonal to inter-annual climate information.**
- **CPC's base should be adjusted so as to incorporate the costs of these projects.**