SOP FOR DATA PROCESSING AND DATA ASSIMILATION

APPROVALS

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REVISION HISTORY

AUTHOR	*REVISED SECTION/PARAGRAPH*	*REV*	*RELEASED*
[Dr. V. S. Prasad]	**[Initial Release, Section 2, etc]**	[##)	See **[Document Control System]**

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1. PURPOSE

This document defines the Standard Operating Procedure (SOP) to be followed for carrying out data processing and data assimilation at ESSO-NCMRWF

2. SCOPE

To instruct Facility Management Service (FMS) Operators to take decisions while executing data processing and data assimilation jobs on ESSO-NCMRWF computing platforms.

3. DEFINITIONS

- HPC - High Performance Computers
- Health of HPC– Availability of all nodes and their communication ports
- Connectivity – National Knowledge Network (NKN) High bandwidth connectivity
- FMS - Facility Management Service
- PoC - Point of Contact
- NCUM Server- Linux server hosting NCUM repositories and UMUI servers.
- NGFS - T574L64 global model with hybrid GSI analysis system
- NCUM - N512L70 global Model with 4D Variational assimilation system
- Table 1 - Volume of GTS and ftp data for each cycle and its % of departure
- Table 2 - Volume of BUFR-TANK files
- Table 3 - Volume of dump files and its % of departure in NGFS
- Table 4 - Volume of assimilated observations and their % of departure in NGFS
- Table 5 - Volume of Obstore and BUFR files and their % of departure in NCUM
- Table 6 - Volume of assimilated observations and their % of departure in NCUM
- Short Forecast - Forecast runs carried out for 6 hour period for assimilation cycle purpose
- Long Forecast - Forecast runs carried out for 240 hour period.
- Analysis outputs - analysis file (gdas1.t??z.sanl) for NGFS and analysis increment file (anal_inc) for NCUM
- If deviation of the volume of files are less than 40% then follow the path green path and if not follow the path under red box. Blue box states the action items.

4. RESPONSIBILITIES

- FMS PoC – CMC, Ltd. (G. P. Singh)
- HPC PoC – IBM (K. Bangarusamy)
- Network PoC - Bharti Airtel (Rahul K.)/CMC Ltd. (Sandeep Gupta)
- Computer Group PoC - E.N. Rajagopal

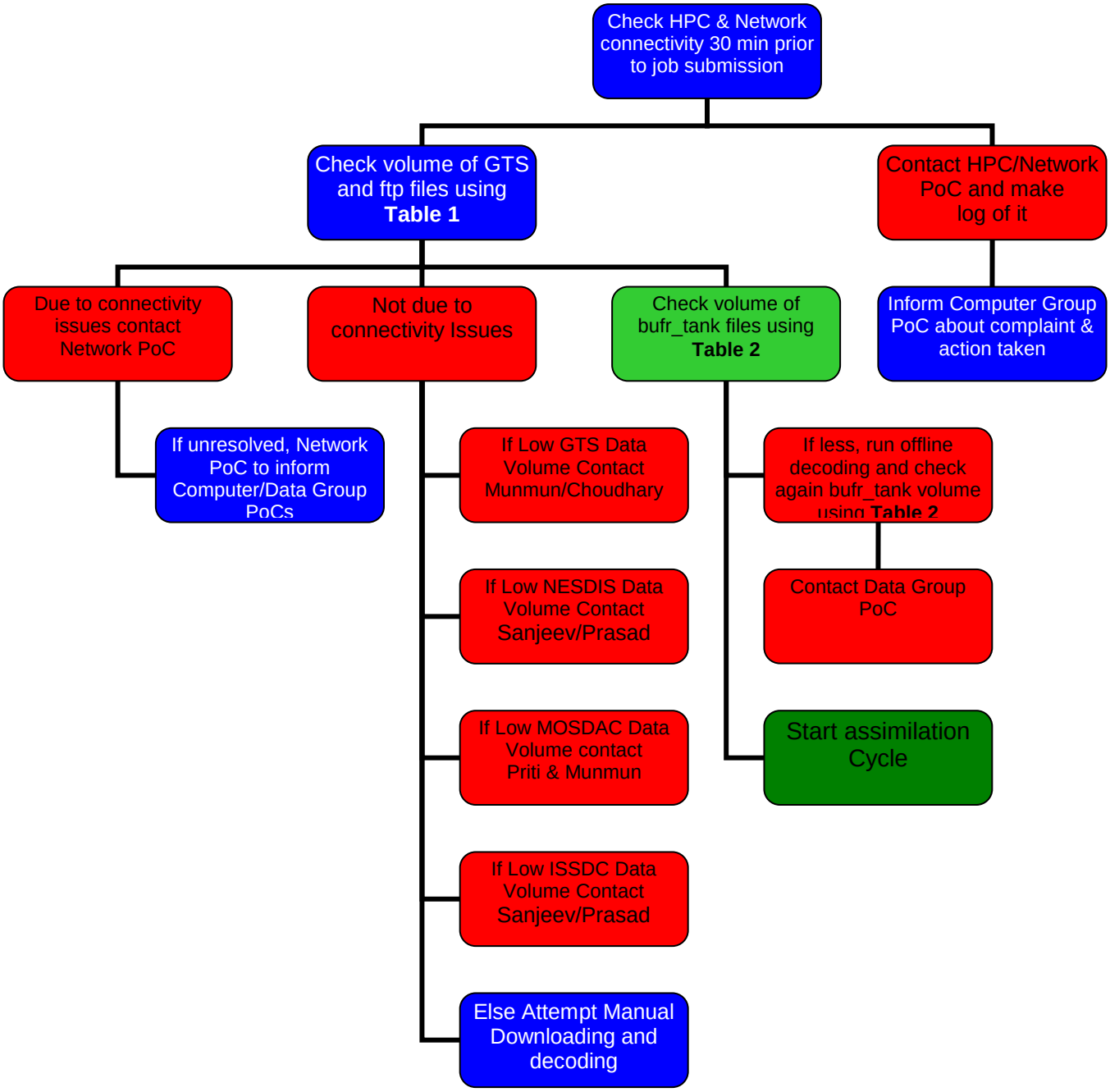
- Data Group PoC-
  - i) Data Acquiring & Processing and Data Assimilation (V.S. Prasad, Munmun Das Gupta and John P. George)
  - ii) GTS and Internet data downloads (Priti Sharma, Amit Verma, S.K. Choudhary)
  - iii) Data Decoding, Obstore, dump files and NCUM bufr files (Aditi, Indira Rani and C.J. Johny)
  - iv) Assimilated Observations (S.K. Singh, Swapan Mallick, D.Srinivas)

5. PROCEDURE

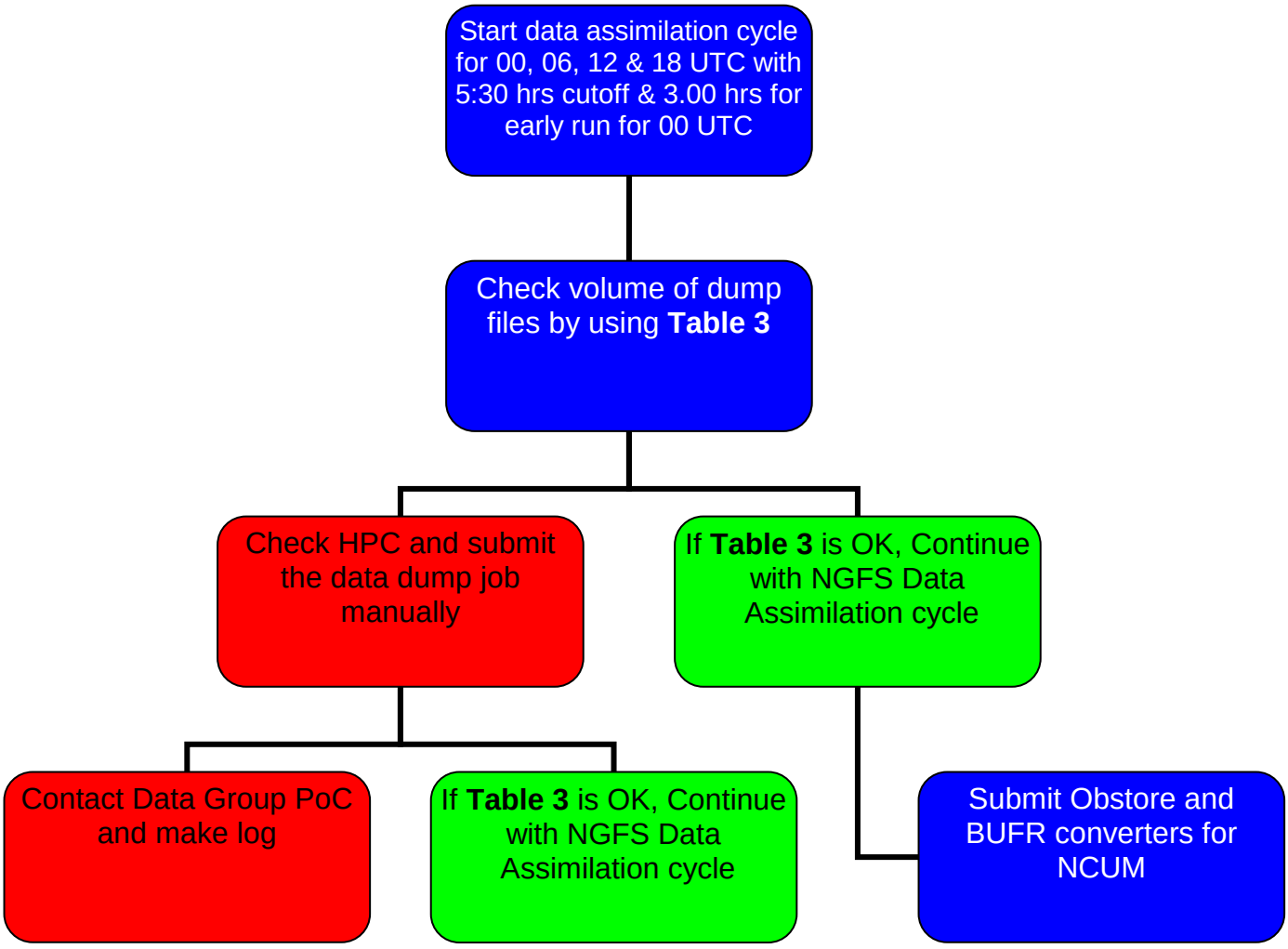
NCMRWF's data reception system consists of GTS data pushing service by ESSO-IMD and data pulls from NESDIS, MOSDAC, ISSDC and Satellite Meteorology Section of ESSO-IMD. All these data transfers use NKN high bandwidth connectivity. The datasets are processed by online decoders and sent to archive directories in real time. The analysis jobs are executed cyclically four times daily at 00, 06, 12 & 18 UTC with 5:30 hour cut off period. Only for 00 UTC early analysis run is carried with a 3 hour cut off and a long forecast (240 hour) job is also executed for this cycle. All these jobs are executed through shell scripts using IBM load leveler. Under normal conditions all the processing steps are carried out automatically and log files are created for monitoring purpose. To maintain quality and standard of output products and to intervene for taking up corrective measures in case of system failures, FMS Operator needs to study the log files that are generated. In the case of NGFS load leveler scripts, "GDAS.ll" (available in /gpfs1/home/exp/gfs/nwprod/jobs directory) gives list of steps and its script/log file details. NCUM analysis jobs are submitted by the FMS Operator from the NCUM server and the main job is "submit_um.sh". NCUM long forecast jobs are submitted on HPC from "umfcst" user account. This document gives details of options available to the FMS Operator while executing these procedures.

5.1 Process Flow

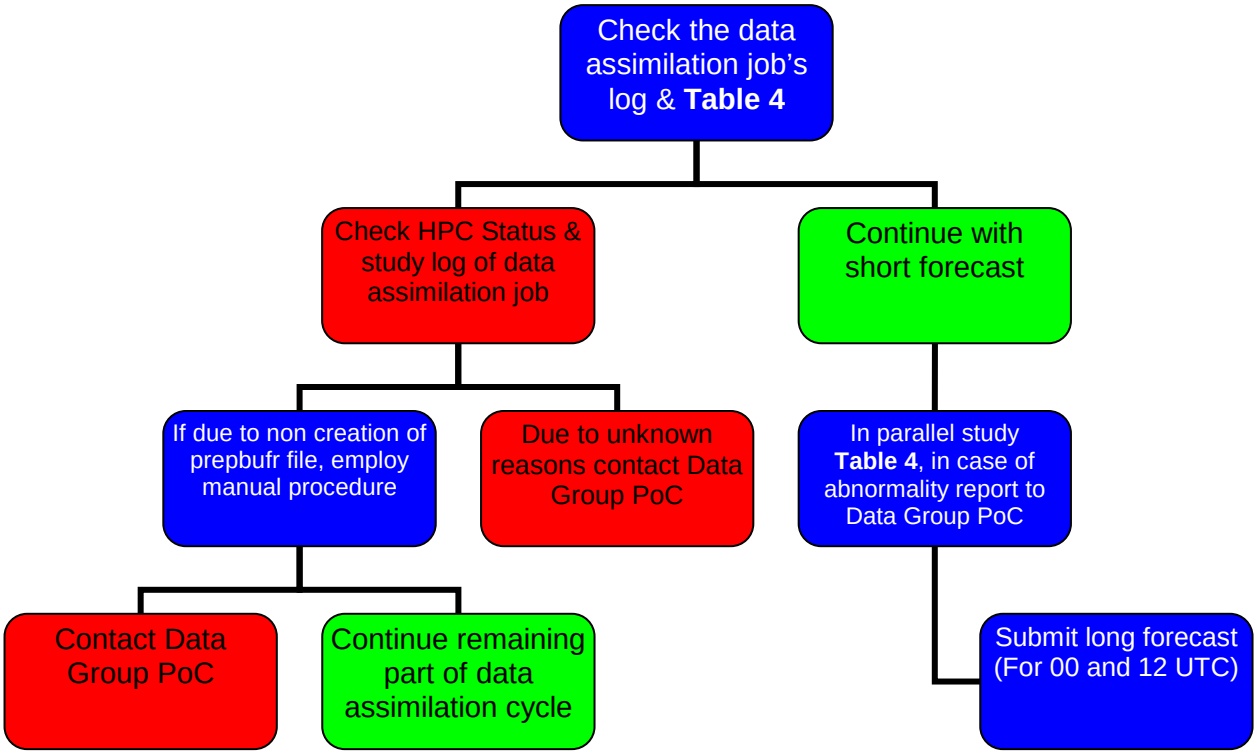
STEP-I: Data Reception & Decoding



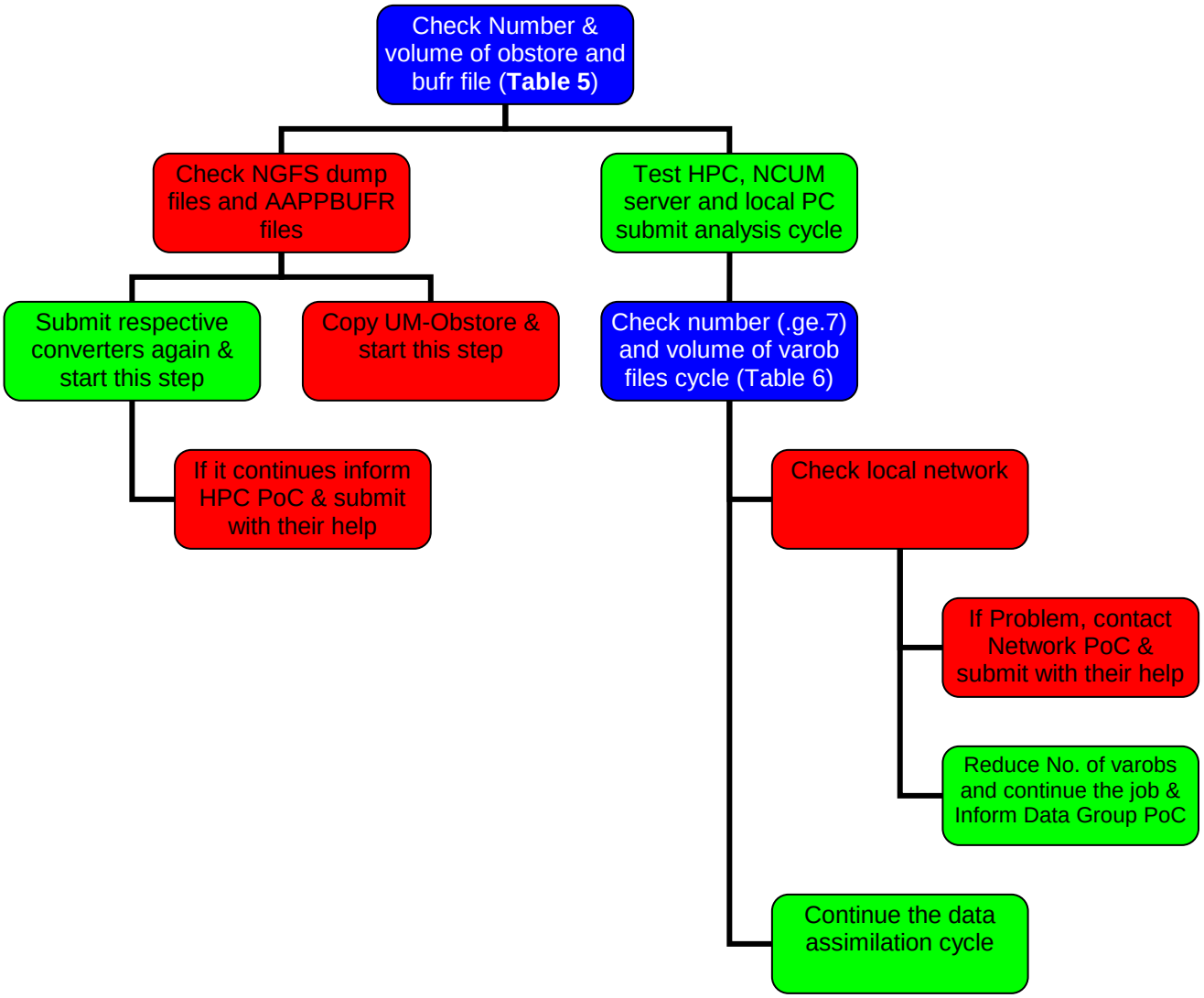
STEP-II: NGFS DATA Processing



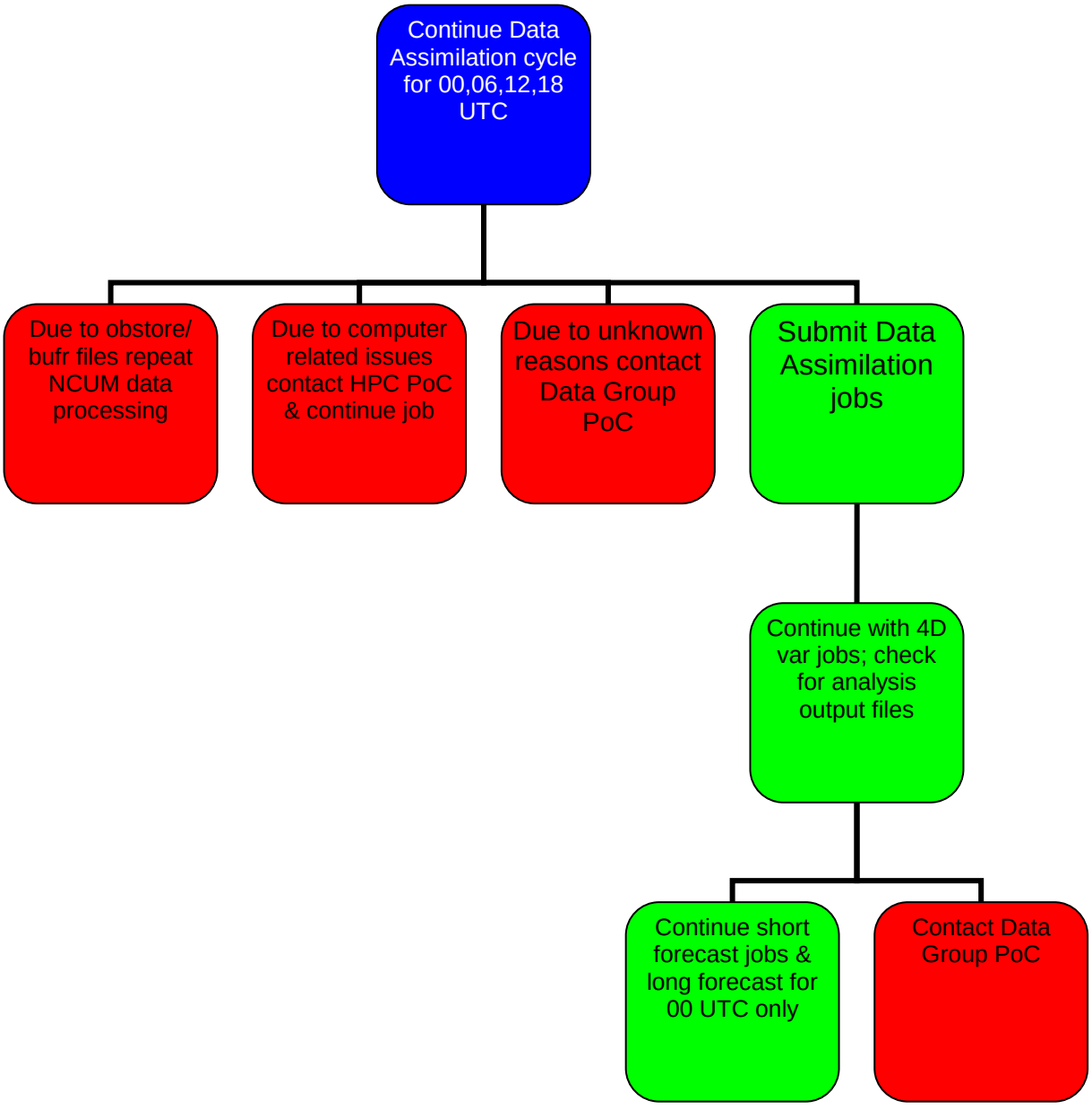
STEP-III: NGFS Analysis



STEP-IV: NCUM Data Processing



STEP–V: NCUM Analysis



5.2 Procedure

If jobs are completed normally the same will be reflected in the log files, else they report abnormal exit and give error numbers and other details why the job failed. By following above steps under normal conditions these problems can be overcome by the FMS Operator. If the problems are not identified, it is to be attended by the Data Group. Any intervention by the FMS Operator for completing the job is to be reported to Data Group and a log has to be maintained for the same.

5.2.1 Overview

The scripts and the job coding is done at the highest efficient level under normal conditions i.e., HPC and its communications working fine and data reception being normal. FMS Operator's intervention is required for day-to-day problems in the data reception, changes in its volume, HPC breakdowns etc. HPC related problems may occur occasionally due to interconnect issues and the ftp data volume depends on the NKN connectivity issues. Hence FMS Operator is required to intervene only if the need arises and a log should be maintained on the problems faced and the action taken thereof.

5.2.2 Details

The details of various data directories and files are given in the NCMRWF reports that are given as references in this document. Appendix-I gives the various tables (Table 1-6) mentioned under the process flow (Step-I to Step-V) that are generated during a typical data assimilation cycle and the FMS Operator is expected to refer to these tables for making correct decisions. Sample log sheets for NGFS and NCUM are given in Appendix-II. The FMS Operator is expected to make entries in the log sheets and forward the same through FMS PoC to Data Group PoC.

6. APPLICABLE REFERENCES

V.S.Prasad, Saji Mohandas, Munmun Das Gupta, E.N. Rajagopal, Surya Kanti Dutta, (2011): Implementation of Upgraded Global Forecasting Systems (T382L64 and T574L64) at NCMRWF, NCMRWF Report No. NCMR/TR/5/2011

E.N. Rajagopal et al. (2012): Report on Implementation of Unified Model based Analysis-Forecast System, NCMRWF Report No. NMRF/TR/2/2012.

V.S. Prasad (2012): Report on Conversion of NCEP Decoded data to UK MET office Obstore format, NCMRWF Report No. NCMR/OB/1/2012

V.S. Prasad (2014): Satellite Data Processing for NCMRWF Unified Model (NCUM), NCMRWF Report No. NMRF/RR/2/2014.

7. QUALITY RECORDS

List of Applicable Quality Records:

- Tables and Graphs
- Model log sheets

Appendix-I

Table 1

Volume of Data reception per cycle 20141201 00cycle

Data	Total (MB)	Departure (%)
GTS	77.4	7.4
NESDIS	2566.5	6.3
MOSDAC	364.5	-16.6

Table 2

BUFR-Tank VOLUME MONITORING

File	Size (MB) Previous Cycle	Size (MB) Current Cycle	Change in Size(MB)
b000	9.62	10.25	0.63
b001	5.38	6.00	0.62
b002	2.50	2.62	0.12
b003	186.75	216.75	30.0
b004	18.00	18.75	0.75
b005	53.75	62.62	8.87
b008	5.75	6.38	0.63
b012	19.00	22.75	3.75
b021	2097.00	2964.50	867.50

Table 3

NGFS BUFR DUMP FILE SIZE MONITORING

Date	Satellite ID	Total (MB)	Departure (%)
2014120200	1bamua	27.95	-3.00
2014120200	1bhrs4	32.23	44.00
2014120200	1bmhs	82.08	41.00
2014120200	1bsaph	63.67	8.00
2014120200	adpsfc	6.52	-25.00
2014120200	adpupa	1.49	0.00
2014120200	aircar	11.69	10.00
2014120200	aircft	2.07	-3.00
2014120200	airsev	274.62	-43.00
2014120200	ascatt	9.14	5.00
2014120200	ascatw	1.44	4.00
2014120200	esamua	6.58	13.00
2014120200	esamub	0.83	-39.00
2014120200	eshrs3	17.81	12.00
2014120200	esmhs	37.46	13.00
2014120200	geoimr	3.53	275.00
2014120200	goesfv	12.45	131.00
2014120200	gome	4.54	4.00
2014120200	gpsro	6.87	-5.00
2014120200	mtiasi	666.19	0.00
2014120200	osbuv8	0.61	0.00
2014120200	proflr	0.25	0.00
2014120200	satwnd	40.03	2.00
2014120200	sfcshp	3.83	1.00
2014120200	sptrmm	0.25	0.00

Table 4

NGFS ASSIMILATED OBSERVATIONS MONITORING

Date	Type	Total	Departure (%)
20141202	Radiance	2623940.80	-9.00
20141202	Wind	418074.80	21.00
20141202	Temperature	131814.47	0.00
20141202	Pressure	35940.33	-24.00
20141202	Moisture	14349.80	0.00
20141202	GPSRO	81577.33	-1.00

Table 5

NCUM OBSTORE & BUFR FILE SIZE MONITORING

Date	Satellite ID	Total (MB)	Departure (%)
2014120100	Satwind	124.76	59.00
2014120100	Scatwind	62.81	5.00
2014120100	GOESClear	3.05	624.00
2014120100	Surface	9.19	-33.00
2014120100	Aircraft	40.38	-5.00
2014120100	Sonde	15.23	-1.00
2014120100	GPSRO	14.19	-1.00
2014120100	ATOVS	15.84	30.00
2014120100	AIRS	40.59	-39.00
2014120100	iasi	59.16	-8.00

Table 6

NCUM VAROBS VOLUME MONITORING

Date	Varobs type	Volume(MB)	Departure(%)
2014120400	Aircraft	4.66	0.00
2014120400	Sonde	5.08	-1.00
2014120400	Satwind	1.12	-49.00
2014120400	GPSRO	6.45	-5.00
2014120400	Surface	8.38	6.00
2014120400	Scatwind	3.42	0.00
2014120400	GOESClear	0.26	183.00
2014120400	ATOVS	15.19	10.00
2014120400	IASI	77.80	-50.00
2014120400	AIRS	65.19	-20.00

Log Sheet of NGFS for _____

a) System Status & Network: Normal/unsatisfactory

b) Data Reception *(Write % of departure):*

Cycle	GTS	NESDIS	MOSDAC	ISRO	IMD
00					
06					
12					
18					
00 Update					

c) Data Processing *(State Normal or Abnormal):*

Cycle	Decoding	dump	TC Relocate	prep
00				
06				
12				
18				
00 Update				

d) Assimilated Observations *(Write % of Departures):*

Cycle	Radiance	Wind	Temp	S. Pres	Moisture	GPSRO
00						
06						
12						
18						
00 Update						

e) Assimilation Cycle *(State Normal or Abnormal):*

	00	*06*	*12*	*18*	*00 Update*
Short forecast					
Angle update					

f) Forecast Job:

Start Time: End Time: Web Page Updation Time:

FMS PoC **Data Group PoC**

Log Sheet of NCUM for _____

a) System Status & Network: Normal/unsatisfactory

b) Data Reception *(Write % of departure):*

c) Data Processing *(State Normal or Abnormal):*

Cycle	Obstore Data Preparation	Satellite Data (BUFR) Preparation
00		
06		
12		
18		

d) Assimilated Observations (OPS output) *(Write % of Departures):*

Cycle	Surface	Sonde	Aircraft	Scat. Wind	Sat. Wind	ATOVS	IASI	AIRS	GOES Rad.	GPSRO
00										
06										
12										
18										

e) Data Assimilation & Short Forecast *(State Normal or Abnormal):*

	00	*06*	*12*	*18*
4DVAR				
3DVAR (Screen)				
Soil Moisture Assimilation				
Surface data Preparation (Snow, SST, Sea-Ice)	*NA*	*NA*		*NA*
Recon (for short forecast)				
Short forecast				

f) Forecast Job:

Start Time: End Time: Web Page Updation Time:

FMS POC **Data Group PoC**