GSI BUFR Interface

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Data processing procedure in GSI

- Observation ingestion and processing in the GSI system
- GSI BUFR ingestion driver and subroutines
- Examples

Data process steps in GSI system

- Step 1: Link BUFR/PrepBUFR file to GSI recognized names in GSI run scripts
- Step 2: GSI Namelist data configuration section: &**OBS_INPUT**
- Step 3: configure info files
- **Step 4: GSI data ingest driver**
- **Step 5: Read in observations from BUFR files and initial check of the observations**
- Step 6: sub-domain partition (Parallel computation)
- Step 7: innovation calculation (O-B)

- Step 1 to 3 have been introduced in GSI tutorial lecture:

  "GSI Fundamentals (2): Run and Namelist" (available on-line

http://www.dtcenter.org/com-GSI/users/docs/tutorial_presentations_2011.php)

- Step 6 and 7 are not in the range of this talk

BUFR ingesting Driver and subroutines

- Observation ingestion and processing in the GSI system
- GSI BUFR ingestion driver and subroutines
- Examples

GSI Data Ingesting Driver

- Subroutine *read_obs* (inside *read_obs.F90*) is used to read, select, and reformat observation data
- It loops through all data types listed in *dtype* and checks the data usage and file availability
  - If the data file exists and info files indicate the use of the data type, one or several processors will be assigned to read the data from the corresponding file setup in *dfile*.

```
&OBS_INPUT
 dmesh(1)=120.0,dmesh(2)=60.0,dmesh(3)=60.0,dmesh(4)=60.0,dmesh(5)=120,time_window_max=1.5,
 dfile(01)='prepbufr',  dtype(01)='ps',    dplat(01)=' ',    dsis(01)='ps',        dval(01)=1.0,  dthin(01)=0,
 dfile(02)='prepbufr'   dtype(02)='t',     dplat(02)=' ',    dsis(02)='t',         dval(02)=1.0,  dthin(02)=0,
 dfile(03)='prepbufr',  dtype(03)='q',     dplat(03)=' ',    dsis(03)='q',         dval(03)=1.0,  dthin(03)=0,
 dfile(04)='prepbufr',  dtype(04)='uv',    dplat(04)=' ',    dsis(04)='uv',        dval(04)=1.0,  dthin(04)=0,
……
 dfile(27)='msubufr',   dtype(27)='msu',   dplat(27)='n14',  dsis(27)='msu_n14',   dval(27)=2.0,  dthin(27)=2,
 dfile(28)='amsuabufr', dtype(28)='amsua', dplat(28)='n15',  dsis(28)='amsua_n15’, dval(28)=10.0, dthin(28)=2,
 dfile(29)='amsuabufr’, dtype(29)='amsua', dplat(29)='n16',  dsis(29)='amsua_n16’, dval(29)=0.0,  dthin(29)=2,
```

GSI Data Ingesting Driver: code example

Example 1: Process conventional (prepbufr) data

```
!
  if(ditype(i) == 'conv')then
     if (obstype == 't'  .or. obstype == 'uv' .or. &
         obstype == 'q'  .or. obstype == 'ps' .or. &
         obstype == 'pw' .or. obstype == 'spd'.or. &
         obstype == 'mta_cld' .or. obstype == 'gos_ctp'  ) then
         call read_prepbufr(nread,npuse,nouse,infile,obstype,lunout,twind,sis,&
             prsl_full)
         string='READ_PREPBUFR'
```

Example 2: Process TOVS 1b data

```
!
      if (platid /= 'aqua' .and. (obstype == 'amsua' .or. &
           obstype == 'amsub' .or. obstype == 'msu'   .or.  &
           obstype == 'mhs'   .or. obstype == 'hirs4' .or.  &
           obstype == 'hirs3' .or. obstype == 'hirs2' .or.  &
           obstype == 'ssu')) then
         llb=1
         lll=1
         if((obstype == 'amsua' .or. obstype == 'amsub' .or. obstype == 'mhs') .and. &
            (platid /= 'metop-a' .or. platid /='metop-b' .or. platid /= 'metop-c'))lll=2
         call read_bufrtovs(mype,val_dat,ithin,isfcalc,rmesh,platid,gstime,&
              infile,lunout,obstype,nread,npuse,nouse,twind,sis, &
              mype_root,mype_sub(mm1,i),npe_sub(i),mpi_comm_sub(i),llb,lll)
         string='READ_BUFRTOVS'
```

Table of Data Ingesting Subroutines(1)

- Table available in both GSI and BUFR User's

Table 4.1: List of data types and subroutines of GSI observation IO

Data type *(ditype)*	Observation type *(obstype)*		Subroutine that reads data	File includes Subroutine
conv	t, uv, q, ps, pw, spd, mta_cld, gos_ctp		read_prepbufr	read_prepbufr
	sst	from mods	read_modsbufr	read_modsbufr
		not from mods	read_prepbufr	read_prepbufr
	srw		read_superwinds	read_superwinds
	tcp		read_tcps	read_tcps
	lag		read_lag	read_lag
	rw (radar winds Level-2)		read_radar	read_radar
	dw (lidar winds)		read_lidar	read_lidar
	rad_ref		read_RadarRef_mosaic	read_RadarRef_mosaic
	lghtn		read_lightning	read_lightning
	larccld		read_NASA_LaRC	read_NASA_LaRC
	pm2_5		read_anowbufr	read_anowbufr

Table of Data Ingesting Subroutines(2)

rad (satellite radiances)	(platform) not AQUA	amsub	read_bufrtovs (TOVS 1b data)	read_bufrtovs (TOVS 1b data)
		amsua		
		msu		
		mhs		
		hirs4,3,2		
		ssu		
	(platform) AQUA	airs	read_airs (airs data)	read_airs (airs data)
		amsua		
		hsb		
	iasi		read_iasi	read_iasi
	sndr, sndrd1, sndrd2 sndrd3, sndrd4		read_goesndr (GOES sounder data)	read_goesndr (GOES sounder data)
	ssmi		read_ssmi	read_ssmi
	amsre_low, amsre_mid amsre_hig		read_amsre	read_amsre
	ssmis, ssmis*		read_ssmis	read_ssmis
	goes_img		read_goesimg	read_goesimg
	seviri		read_seviri	read_seviri
	avhrr_navy		read_avhrr_navy	read_avhrr_navy
	avhrr		read_avhrr	read_avhrr

Table of Data Ingesting Subroutines(3)

ozone	subuv2, omi, gome, o3lev	read_ozone	read_ozone
co	mopitt	read_co	read_co
pcp	pcp_ssmi, pcp_tmi, pcp_amsu,pcp_stage3	read_pcp	read_pcp
gps	gps_ref, gps_bnd	read_gps	read_gps
aero	modis	read_aerosol	read_aerosol

- 28 subroutines to read in different kinds of BUFR/PrepBUFR files

Examples

- Observation ingestion and processing in the GSI system
- GSI BUFR ingestion driver and subroutines
- Examples

Example 1: read_prebufr.f90

- Under ./src/main
- Original has 1375 lines
- About 197 lines related to BUFR IO

```
data hdstr  /'SID XOB YOB DHR TYP ELV SAID T29'/
data hdstr2 /'TYP SAID T29 SID'/
data obstr  /'POB QOB TOB ZOB UOB VOB PWO CAT PRSS' /
data drift  /'XDR YDR HRDR                    '/
data sststr /'MSST DBSS SST1 SSTQM SSTOE           '/
data qcstr  /'PQM QQM TQM ZQM WQM NUL PWQ     '/
data oestr  /'POE QOE TOE NUL WOE NUL PWE     '/
data satqcstr  /'QIFN'/
data prvstr /'PRVSTG'/
data sprvstr /'SPRVSTG'/
data levstr  /'POB'/
data metarcldstr /'CLAM HOCB'/      ! cloud amount and cloud base height
data metarwthstr /'PRWE'/           ! present weather
data metarvisstr /'HOVI'/           ! visibility
data geoscldstr /'CDTP TOCC GCDTT CDTP_QM'/
```

Example 2: read_airs.f90

- Reads BUFR format AQUA radiance (brightness temperature) observations
- Original has 768 lines
- About 82 lines related to BUFR IO

```
'SIID YEAR MNTH DAYS HOUR MINU SECO CLATH CLONH SAZA BEARAZ FOVN'

 call ufbrep(lnbufr,allchan,1,n_totchan,iret,'TMBR')

 call ufbint(lnbufr,aquaspot,2,1,iret,'SOZA SOLAZI')
```

Examples: summary

- Totally 4 examples available:
  - read_prepbufr.f90
  - read_airs.f90
  - read_bufrtovs.f90
  - read_gps.f90
- Can be fond in the Examples Page of the BUFR user's website
- Can be compiled and used to decode the PrepBUFR and BUFR files from NCEP
- Will add more examples based on resources

Questions?

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