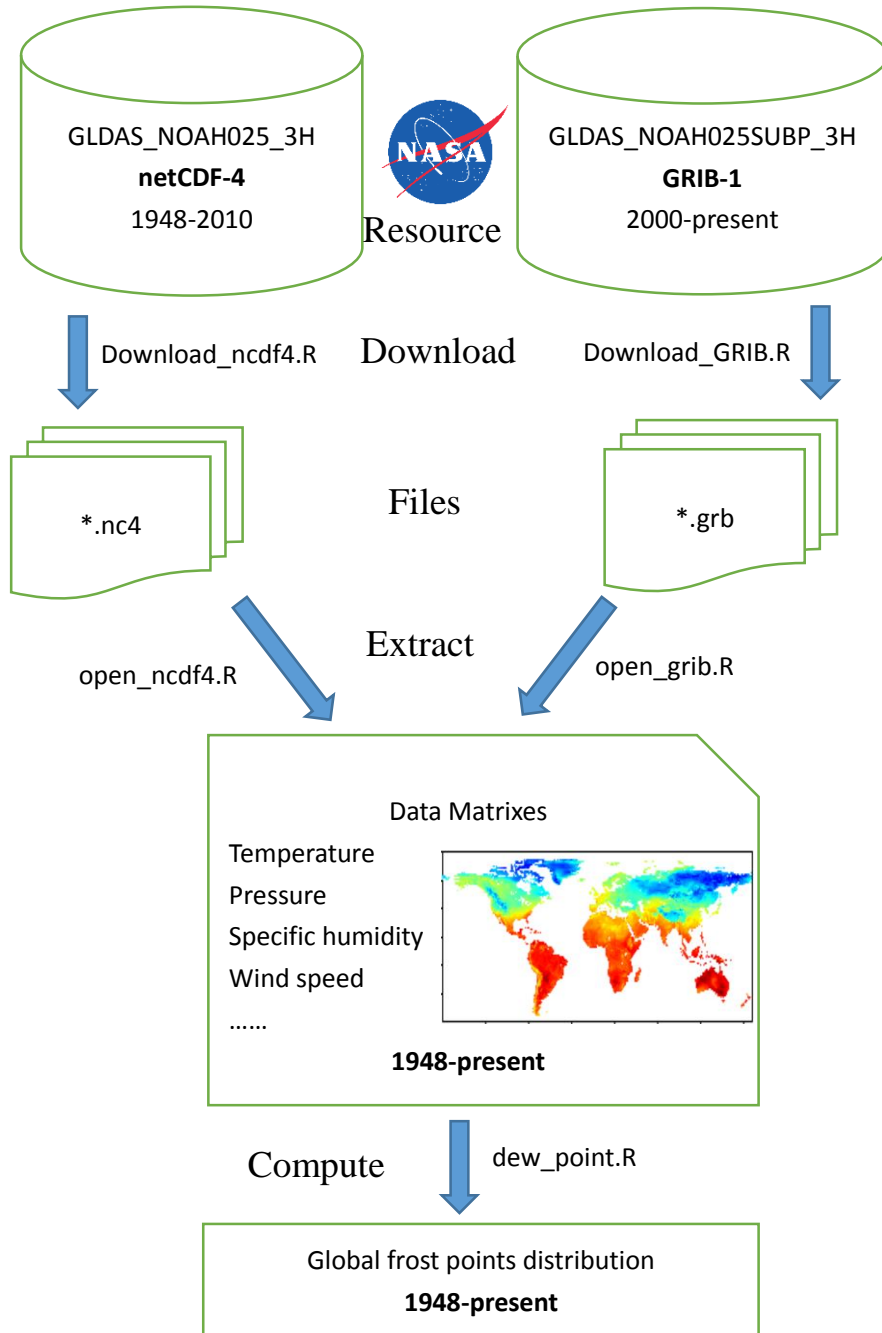


# Progress Report #3: Data downloading

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## 1 Works have done so far



## 2 Download data

Downloading works are done in R by using the “RCurl” package.

The core function for downloading GRIB files:

```
# download one file from "GLDAS_NOAH025SUBP_3H" dataset
# input: year(YYYY [2000-2016]); day(DDD [001-366]);
#         time(TT [00,03,06,09,12,15,18,21])
# output: download the file:
# "GLDAS_NOAH025SUBP_3H.AYYYYDDD.TT00.***.*****.grb"
library(RCurl)
Download_GRIB<-function(year,day,time){
# -----time check-----
  legal_time<-c("00","03","06","09","12","15","18","21")
  if (is.na(match(time,legal_time))){ # time is legal or not
    return(paste(time,"is not a legal time. Legal time must be in
[00,03,06,09,12,15,18,21]")) # not legal
  }
# ----- Url check-----
  web<-
"ftp://hydro1.sci.gsfc.nasa.gov/data/s4pa/GLDAS_V1/GLDAS_NOAH025SUBP_3H"
  Url<-paste(web,"/",year,"/",day,"/",sep="")
  if (!url.exists(Url)){ # url is real or not
    return(paste(Url,"does not exist.")) # not real, end function
  }
# ----- get the list of files' names-----
  fnames <- getURL(Url,ftp.use.epsv = F,dirlistonly = T)
  x <- strsplit(fnames, "\r\n")[[1]]
  fname_list <- character(0) # initialize empty file name list
  # reject ".xml" or other files
  for (i in 1:length(x)) {
    fileformat <- substr(x[i], nchar(x[i]) - 2, nchar(x[i]))
    if (fileformat == "grb") {
      fname_list <- c(fname_list, x[i])
    }
  }
# ----- get the file's name for downloading-----
  down_name<-NA # file for downloading
  for (i in 1:length(fname_list)){
    T<-substr(fname_list[i], 31,32 ) # get the time in files' name
    if (T==time) { # matched
      down_name<-fname_list[i]
      break
    }
  }
}
```

```

if (is.na(down_name)){
  return("file not found.")
}

# ----- download the file-----

dat <-
  getBinaryURL(
    paste(Url,down_name,sep="")
  )
writeBin(dat, paste("c:/data/download/",down_name,sep=""))

return(paste(down_name,"has been downloaded."))
}

```

An example for downloading the GRIB data of day 68 to 86 at 06Z o'clock in 2015:

```

for (n in 68:86){
  day<- formatC(n, width=3, flag="0") # 66 to 066
  result<-Download_GRIB("2015",day,"06")
  print(result)
}

```

The downloading function for netCDF-4 files is almost the same.

### 3 Appendix: Data Contents

#### 3.1 (GLDAS\_NOAH025SUBP\_3H) GRIB-1

Band No.	Attribute	No.	Attribute
1	Net short wave (surface) [W/m <sup>2</sup> ]	18	Soil moisture content [kg/m <sup>2</sup> ]
2	Net long wave (surface) [W/m <sup>2</sup> ]	19	Soil moisture content [kg/m <sup>2</sup> ]
3	Latent heat flux [W/m <sup>2</sup> ]	20	Soil moisture content [kg/m <sup>2</sup> ]
4	Sensible heat flux [W/m <sup>2</sup> ]	21	Soil moisture content [kg/m <sup>2</sup> ]
5	Ground heat flux [W/m <sup>2</sup> ]	22	Total cloud cover [%]
6	Surface lifted index [K]	23	Wind speed [m/s]
7	Best (4-layer) lifted index [K]	24	Temp. [K]
8	Evaporation [kg/m <sup>2</sup> ]	25	Specific humidity [kg/kg]
9	Storm surface runoff [kg/m <sup>2</sup> ]	26	Pressure [Pa]
10	Baseflow-groundwater runoff [kg/m <sup>2</sup> ]	27	Downward short wave flux [W/m <sup>2</sup> ]
11	Snow melt [kg/m <sup>2</sup> ]	28	Downward long wave flux [W/m <sup>2</sup> ]
12	Brunt-Vaisala frequency <sup>2</sup> [1/s <sup>2</sup> ]		
13	Accum. snow [kg/m <sup>2</sup> ]		
14	Soil temp. [K]		
15	Soil temp. [K]		
16	Soil temp. [K]		
17	Soil temp. [K]		

3.2 (GLDAS\_NOAH025\_3H) netCDF-4  
(Hualan Rui & Hiroko Beaudoin, 2015)

Short Name	Description	Unit
Swnet_tavg	Net short wave radiation flux	W m-2
Lwnet_tavg	Net long-wave radiation flux	W m-2
Qle_tavg	Latent heat net flux	W m-2
Qh_tavg	Sensible heat net flux	W m-2
Qg_tavg	Heat flux	W m-2
Snowf_tavg	Snow precipitation rate	kg m-2 s-1
Rainf_tavg	Rain precipitation rate	kg m-2 s-1
Evap_tavg	Evapotranspiration	kg m-2 s-1
Qs_acc	Storm surface runoff	kg m-2
Qsb_acc	Baseflow-groundwater runoff	kg m-2
Qsm_acc	Snow melt	kg m-2
AvgSurfT_inst	Average Surface Skin temperature	K
Albedo_inst	Albedo	%
SWE_inst	Snow depth water equivalent	kg m-2
SnowDepth_inst	Snow depth	m
SoilMoi0_10cm_inst	Soil moisture	kg m-2
SoilMoi10_40cm_inst	Soil moisture	kg m-2
SoilMoi40_100cm_inst	Soil moisture	kg m-2
SoilMoi100_200cm_inst	Soil moisture	kg m-2
SoilTMP0_10cm_inst	Soil temperature	K
SoilTMP10_40cm_inst	Soil temperature	K
SoilTMP40_100cm_inst	Soil temperature	K
SoilTMP100_200cm_inst	Soil temperature	K
PotEvap_tavg	Potential evaporation rate	W m-2
ECanop_tavg	Canopy water evaporation	W m-2
Tveg_tavg	Transpiration	W m-2
Esoil_tavg	Direct Evaporation from Bare Soil	W m-2
RootMoist_inst	Root zone soil moisture	kg m-2
CanopInt_inst	Plant canopy surface water	kg m-2
Wind_f_inst	Wind speed	m/s
Rainf_f_tavg	Total precipitation rate	kg m-2 s-1
Tair_f_inst	Temperature	K
Qair_f_inst	Specific humidity	kg/kg
Psurf_f_inst	Pressure	Pa
SWdown_f_tavg	Downward short-wave radiation flux	W m-2
LWdown_f_tavg	Downward long-wave radiation flux	W m-2