GISsurfer
Data Parameter

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This PDF file is online at
https://mappingsupport.com/p2/help/GISsurfer-data-parameter.pdf

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1. About GISsurfer

GISsurfer (https://gissurfer.com) is a general purpose web map with broad support for displaying data hosted on various kinds of geographic information system (GIS) servers. For a list of **video and PDF tutorials** see https://mappingsupport.com/p2/gissurfer-help.html.

2. Introduction to data parameter

The **data parameter** is what gives GISsurfer most of its ability to display useful information. When a GISsurfer map link does not include a data parameter then the only information the map can display about an area is whatever information is part of the built-in basemaps and built-in overlays.

The data parameter is used to display:

- Map title
- Lines with various colors and widths
- Markers
- GIS basemaps (in addition to the built-in basemaps)
- GIS overlays (in addition to the built-in overlays)
- Georeferenced JPG and PNG images
- Track data from GPX files with various colors and widths

More features are planned for the data parameter.

Important: When the data parameter is used it must be the **last parameter** in the GISsurfer map link.

The data parameter replaces the &inline, &txtfile and &textfile parameters. Existing GISsurfer links that use those parameters should continue to work but new GISsurfer links should use the data parameter instead

If you need help using GISsurfer, please visit https://gissurfer.com. The detailed documentation is in a series of PDF files on the "Help" page.

3. Display markers

Here is a GISsurfer map link that uses the data parameter to display several markers on the map.

https://mappingsupport.com/p2/gissurfer.php?data=37.370497,-121.936912||37.619431,-122.373877||37.717829,-122.222385||37.658472,-122.120933||37.512784,-122.250023||37.460929,-122.114239

Note the two vertical lines after each coordinate. That symbol is an uppercase character on the righthand side of a keyboard. Think of that as an **end-of-line** or **line break** indicator. More on that a bit later in this PDF file.

Since the above map link does not have a basemap parameter, the **default 'USA basemap'** is displayed.

Also since the above map link does not have a center parameter and zoom parameter, the map is **automatically centered and zoomed** such that all of the markers are on the user's screen.

A future update to GISsurfer will add various features to markers such as titles, descriptions, different colors, custom symbols, etc.

4. Display lines

Here is a GISsurfer map link that uses the data parameter to draw a line on the screen.

https://mappingsupport.com/p2/gissurfer.php?data=line=on||45.525032,-122.687062||45.525123,-122.681236||45.522020,-122.681081||45.521345,-122.678543||45.517334,-122.680673||45.515458,-122.673587

Just like the earlier map that showed markers, the default basemap is used and the map is **automatically centered and zoomed** such that all of the line is on the user's screen.

To turn on the line drawing feature use the command line=on.
To turn off the line drawing feature use the command line=off.

By default lines are red and two pixels wide. In other words, the command

line=on

is the same as the command

line=on^color=ff0000^width=2

Note the caret ^ symbol. Think of that symbol as separating pieces of information. The || symbol and the ^ symbol are delimiters. In other words, **the data parameter displays delimited data**.

The value for color is an RGB (Red Green Blue) code. For pure green the RGB code is 00ff00. For pure blue the code is 0000ff. There are many online color picking tools. Here is one that does not have a bunch of ads. https://colorpicker.me To learn more you could do a google search on: RGB color.

If you change the line color and/or width, then those new settings become the default for the current map. For example, the following map has three lines. The first line uses the default style. The second line changes the style to blue and 4 pixels wide. The third line uses the revised style.

https://mappingsupport.com/p2/gissurfer.php?data=line=on||47.611466,-122.342377||45.523480,-122.654800||47.657694,-117.422218||line=off||line=on^color=0000ff^width=4||47.428654,-121.420212||46.228872,-119.099007||line=off||line=on||47.657694,-117.422218||47.020300,-122.906799

As in the earlier examples, the default basemap is used and the map is automatically centered and zoomed such that all of the data appears on the user's screen.

5. TXT files

Including the content for the data parameter right in the GISsurfer map link is a fast way to quickly produce map links. However, the resulting GISsurfer link can quickly become quite long. This is particularly true when you are using the data parameter to specify multiple GIS overlay layers and/or basemaps. The solution is to put the contents for the data parameter into a TXT file, put the TXT file online and then point the data parameter at the TXT file. Another section of this PDF file has step-by-step instructions showing how to use Google Drive to **host TXT files for free**.

Below is a GISsurfer link that uses the data parameter to point to a TXT file that is online. This map can display more than 20 GIS overlay layers related to weather. To see the list of GIS overlay layers that you can turn on/off/restack, click the basemap button and then look under the "Overlay" heading. Mobile users will need to scroll down. If all these GIS overlay layers were directly specified by the data parameter, imagine the length of the resulting map link.

https://mappingsupport.com/p2/gissurfer.php?center=34.884782,-98.525391&zoom=4&basemap=USA_basemap&overlay=State_boundary,Weather_watch_warning&data=https://mappingsupport.com/p2/special_maps/disaster/USA_rain_flood.txt

There are three steps for using a TXT file to hold content for the data parameter.

1. Put the content for the data parameter into a TXT file.
2. Put the TXT file online. **Google Drive will host your TXT files for free.**
3. Make a GISsurfer map link with the data parameter set to the address for the TXT file.

Anything you can specify directly with the data parameter you can also specify with a TXT file. For example, the prior section of this PDF showed a GISsurfer link with three lines. Below is the content of a TXT file that contains that same data. Now you see why the || symbol can be thought of as an end-of-line indicator.

```
line=on
47.611466,-122.342377
45.523480,-122.654800
47.657694,-117.422218
line=off
line=on^color=0000ff^width=4
47.428654,-121.420212
46.228872,-119.099007
line=off
line=on
47.657694,-117.422218
47.020300,-122.906799
```

Since that TXT file is online on Google Drive we can make a map link with the data parameter pointing to that TXT file. Again, step-by-step instructions for hosting TXT files for free on Google Drive are in another section of this PDF file.

https://mappingsupport.com/p2/gissurfer.php?data=file_name.txt^https://drive.google.com/uc?id=1f0NTRx2IGD-DneP66a6TwTtzNrtVmRXX

The data parameter can also be used to specify both one or more TXT files together with content specified in the map link. The following map displays the same three lines plus two markers. Note that since the TXT file (see content shown above) left line drawing 'on' it is necessary to turn line drawing 'off' in order to display markers instead of extending the third line.

https://mappingsupport.com/p2/gissurfer.php?data=filename.txt^https://drive.google.com/uc?id=1f0NTRx2IGD-DneP66a6TwTtzNrtVmRXX||line=off||46.853130,-121.760101||46.202533,-121.490593

The data parameter can have **multiple TXT files**. Remember to use the || delimiter after each TXT file address.

You can also **nest TXT files**. This is a handy technique to use when you want to make several different maps where each one has both some unique GIS layers and some common GIS layers. Put the GIS layer specifications that are common to all the maps into a TXT file and put that TXT file online. Then in the **TXT file for each map** include the GIS layer specifications for the unique GIS layers that map can display and also include the address for the TXT file with the specifications for the GIS layers that are common to all the maps. Note that TXT file nesting is only supported for one layer deep.

To include a comment in a TXT file start the line with //. Blank lines are allowed and can improve readability.

6. Display map title

Here is a GISsurfer map link that uses the data parameter to display a title on the map.

https://mappingsupport.com/p2/gissurfer.php?data=title=Bandera_mountain||https://mappingsupport.com/gpx/Bandera.gpx

To display a title in the upper left corner of the map include the command title=_____ as part of the data parameter. If the title is directly part of the data parameter as in the example above, then use an **underline character** in place of any spaces in the title. The   you see in the title are html commands that make the title appear in bold type. Note the end-of-line delimiter || after the title.

Use <br> to make a multi-line title. For example:

https://mappingsupport.com/p2/gissurfer.php?data=title=Bandera
Mountain||https://mappingsupport.com/gpx/Bandera.gpx

Alternatively, you could put the title in a TXT file. If you do that then it is not necessary to use an underline character instead of a space.

7. Display data hosted on ArcGIS servers

Government agencies at all levels, from local to federal, are hosting data on ArcGIS servers. **GISsurfer provides a super easy way for anyone to make their own custom interactive maps to display data that is hosted on those servers.**

Here is the basic syntax to add a GIS **overlay** to the map.
overlay^name=_____^url=_____^layers=_____

Here is the basic syntax to add a GIS **basemap** to the map.
basemap^name=_____^url=_____^layers=_____

Here is a GISsurfer map link centered on Florida that uses the data parameter to display an ArcGIS layer that shows weather stations. To see the **most current weather observations**, zoom in and click a symbol. You will see a popup with all the **attribute data** the ArcGIS server has for that weather station. Click the link in the popup.

https://mappingsupport.com/p2/gissurfer.php?center=27.382629,-81.540527&zoom=6&basemap=USA_imagery&overlay=Weather_station&data=overlay^name=Weather_station^url=https://maps1.arcgisonline.com/arcgis/rest/services/NWS_Weather_Stations/MapServer^layers=2-4

This GISsurfer map link uses the following five parameters.

center	Center of the map when it opens
zoom	Zoom level when the map opens
basemap	Basemap to display
overlay	Name of any GIS overlay layer that will be 'on' when the map opens. Note that an underline character is used instead of a space.
data	Specification for an ArcGIS layer

The specification for the GIS layer has the following parts separated by the caret ^ symbol.

overlay	This value must be "overlay" or "basemap"
name	**You make up** a descriptive name. Use this same name in the 'overlay' parameter in the map link.
url	Address on the ArcGIS server
layers	Layer number(s) on the ArcGIS server

ArcGIS servers have a table on contents that consists of a series of web pages. The top of the table of contents always has an internet address that ends in "**rest/services**". Here is the table of contents page that is used in the above GISsurfer map link.
https://maps1.arcgisonline.com/arcgis/rest/services/NWS_Weather_Stations/MapServer

If you open the above link you will see a lot of metadata. Scroll down to the section titled "**Layers:**". Here you see the layer numbers that are used in a GISsurfer map link to display the

data. The layer names here are merely descriptive. You are not required to use the same names in a GISsurfer map link. It is the **layer number** that is important, not the layer name.

To help you find the internet address for government ArcGIS servers, here is a PDF file with a curated list of well over 3,000 government ArcGIS server addresses. The list is updated once per week and any dead links are fixed or flagged.
https://mappingsupport.com/p/surf_gis/list-federal-state-county-city-GIS-servers.pdf

Tips: A **Google advanced search** can help you locate data layers on an ArcGIS server. Here is an ArcGIS server operated by the State of Washington.
https://gismanager.rco.wa.gov/arcgis/rest/services
To search that server for data related to trails, enter the following as a google search. The 'site' keyword limits your search to just that ArcGIS server.

trails site:https://gismanager.rco.wa.gov/arcgis/rest/services

A fast way to actually look at data on an ArcGIS server is to **'surf' that data with GISsurfer**. Click the basemap button and then look under the "Overlay" heading. Mobile users might need to scroll down. Click "Add GIS overlays". Paste in the address for an ArcGIS server and then click "Send request to GIS server".

The left side of your screen will display a page from the table of contents of that ArcGIS server. The right side of the screen displays the map. Drill down on the table of contents until you get to a layer you want to display. Click that layer in the table of contents and that data appears on the screen. Here is a PDF file with more information on how to use GISsurfer to 'surf' the data hosted on an ArcGIS server.
https://mappingsupport.com/p2/help/GISsurfer-surfing-tips.pdf

Tip: Use the 'surfing' feature to display GIS data on the map then click **Menu ==> Link to this map.** GISsurfer makes the **data** parameter for you and displays a link that will replicate the map on your screen including the GIS data.

An ArcGIS server can have several different types of data. GISsurfer can display data that is hosted as **MapServer**, **FeatureServer** or **ImageServer** data. To determine the data type you need to look at the address of the data on the ArcGIS server. Scroll back up in this PDF file and look at the weather station map link. Note that the map is displaying **MapServer** data.

The syntax for making a GISsurfer map link is the same except as follows:

* **MapServer** specifications can use multiple layer numbers. For example, assuming these layer numbers exist at the same address on the ArcGIS server, the following are all valid.
    ^layers=3
    ^layers=3,4,5,6
    ^layers=3-6
    ^layers=2,8,11-13
* **FeatureServer** specifications only use a single layer number.
* **ImageServer** specifications do not use layer numbers.

Here is a map that displays **FeatureServer** data showing recent wind reports. Click any symbol for details.

https://mappingsupport.com/p2/gissurfer.php?center=36.985003,-100.019531&zoom=4&basemap=USA_basemap&overlay=Wind_report_last_24hrs&data=overlay^name=Wind_report_last_24hrs^url=https://services9.arcgis.com/RHVPKKiFTONKtxq3/arcgis/rest/services/NOAA_storm_reports_v1/FeatureServer^layers=2

And below is a map displaying **ImageServer** data consisting of aerial photos for the State of Maryland. Note that there is no layer number. Also note that the map link specifies this data as a 'basemap' instead of an 'overlay'. And since this basemap is 'on' when the map opens, the map will display the Maryland aerial photos and the rest of the map will be blank.

It might take a few seconds for this map to open.

https://mappingsupport.com/p2/gissurfer.php?center=39.023306,-77.628786&zoom=7&basemap=Maryland_aerial&data=basemap^name=Maryland_aerial^url=https://geodata.md.gov/imap/rest/services/Imagery/MD_SixInchImagery/ImageServer

The following map link shows how to make an overlay layer **semi-transparent**. This map uses the FSTopo basemap which does not show tree cover. The map also displays some GIS layers that are specified in a TXT file and displays the federal NAIP aerials.

This first link displays the NAIP aerials with no transparency. Since this overlay is 'on top' it completely hides the basemap and the other overlays.

https://mappingsupport.com/p2/gissurfer.php?center=47.428227,-121.421757&zoom=14&basemap=FSTopo&overlay=USA_main_contour_lines,Landform_names,USFS_recreation_site,Aerial_NAIP&data=https://mappingsupport.com/p2/recreation/USFS_recreation.txt||overlay^name=Aerial_NAIP^url=https://gis.apfo.usda.gov/arcgis/rest/services/NAIP/USDA_CONUS_PRIME/ImageServer

For this second link the aerials are made semi-transparent so that the basemap and other GIS overlays are also visible.

https://mappingsupport.com/p2/gissurfer.php?center=47.428227,-121.421757&zoom=14&basemap=FSTopo&overlay=USA_main_contour_lines,Landform_names,USFS_recreation_site,Aerial_NAIP&data=https://mappingsupport.com/p2/recreation/USFS_recreation.txt||overlay^name=Aerial_NAIP^url=https://gis.apfo.usda.gov/arcgis/rest/services/NAIP/USDA_CONUS_PRIME/ImageServer^opacity=0.35

8. Restyle ArcGIS data and other advanced tips

Many ArcGIS MapServer layers support a feature called dynamic layers. This feature allows GISsurfer to tell the server to restyle the data before delivering the data to the map. You can

change line color, line width, polygon fill, labels and more. This is extremely useful! If you make your own GISsurfer map links then this is a feature you will want to use.

You can also make a GISsurfer map link that only displays part of a data layer. You can do this for both MapServer and FeatureServer data.

These advanced techniques are covered in the following PDF file along with plenty of examples.
https://mappingsupport.com/p2/help/GISsurfer-advanced-arcgis-tips.pdf

9. Display ArcGIS data that is tiled

Here is a GISsurfer map link that uses the data parameter to display an XYZ tile service that shows surface water in the USA. Zoom in for a lot more detail including intermittent streams.

https://mappingsupport.com/p2/gissurfer.php?center=39.197552,-96.679687&zoom=4&basemap=USA_imagery&overlay=All_stream_river_lake&data=overlay^name=All_stream_river_lake^url=https://basemap.nationalmap.gov/arcgis/rest/services/USGSHydroCached/MapServer/tile/{z}/{y}/{x}

If data on an ArcGIS server is 'tiled' then instead of using the layer number syntax as previously shown, then you should use the XYZ syntax shown above. **Using the tile syntax will usually display the data faster than using the layer number syntax.**

You can easily tell if data on an ArcGIS server can be displayed using the tile syntax. Here is the ArcGIS server's table of contents page for the water data:
https://basemap.nationalmap.gov/arcgis/rest/services/USGSHydroCached/MapServer
Open the above link and note where it says:

Single Fused Map Cache: true
Tile Info: ...

That information indicates you can use the tile syntax to display the data.

For example, here is the table of contents page for a basemap produced by the Oregon Department of Transportation.
https://gis.odot.state.or.us/arcgis1006/rest/services/basemaps/Basemap_Overlay_WM/MapServer
If you scroll past the list of layers you will see that it says "**Single Fused Map Cache: true**" and you will also see the "Tile Info". Below is a GISsurfer link to display that basemap as tiles.

https://mappingsupport.com/p2/gissurfer.php?center=45.521864,-122.683639&zoom=12&basemap=Oregon&data=basemap^name=Oregon^url=https://gis.odot.state.or.us/arcgis1006/rest/services/basemaps/Basemap_Overlay_WM/MapServer/tile/{z}/{y}/{x}

Here is another useful example that you can edit to meet your own needs. Below is a link to a table of contents page from an ArcGIS server operated by the USGS. Most of the data this layer can display is public land managed by various agencies.
https://gis1.usgs.gov/arcgis/rest/services/padus3/Fee_Managers/MapServer

By looking at this table of contents page you should recognize that (1) the data is tiled and (2) dynamic layers are supported. However, in order for GISsurfer to tell the server to restyle the data via dynamic layers, the data must be displayed with layer number syntax. The following link displays this data twice. **First**, the data is displayed with XYZ syntax and an opacity value to make the colored fill semi-transparent. **Second**, the data is displayed with layer number syntax and dynamic layers to only display black outlines. A later video in this series will show you how to use dynamic layers.

https://mappingsupport.com/p2/gissurfer.php?center=47.398569,-120.317459&zoom=11&basemap=USA_basemap&overlay=PAD-US_all,PAD-US_all_outline&data=overlay^name=PAD-US_all^url=https://gis1.usgs.gov/arcgis/rest/services/padus3/Fee_Managers/MapServer/tile/{z}/{y}/{x}^opacity=0.5||overlay^name=PAD-US_all_outline^url=https://gis1.usgs.gov/arcgis/rest/services/padus3/Fee_Managers/MapServer^layers=0^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSFS","style":"esriSLSSolid","color":[0,0,0,0],"outline":{"type":"esriSLS","style":"esriSLSSolid","color":[0,0,0,255],"width":1.25}}}}}]

10. Display tiled data that is *not* hosted on ArcGIS servers

When you find tiled GIS data that is *not* host on ArcGIS servers, then there likely is an important difference in the syntax required to display that data. Instead of {z}/{y}/{x} you would use {z}/{x}/{y}. Note that the x and y values are reversed.

a. RealEarth at University of Wisconsin-Madison

The University of Wisconsin-Madison is hosting a variety of tiled GIS data they call "RealEarth". https://www.ssec.wisc.edu/realearth/

The address for any of this tiled data is:
https://realearth.ssec.wisc.edu/tiles/_____/{z}/{x}/{y}.png
Fill in the underline with the name of one of their datasets.

The RealEarth data catalog is at https://realearth.ssec.wisc.edu/products/#
The data name to use in the tile address is shown in [square brackets].

Another way to look through their data catalog is
https://realearth.ssec.wisc.edu/thredds/catalog.xml
The last part of each link is the name of the data to use in the tile address.

Here is an example that displays the "globalvis" data as a basemap.
https://mappingsupport.com/p2/gissurfer.php?center=37.337256,-97.558594&zoom=4&basemap=Global_visible&data=basemap^name=Global_visible^url=https://realearth.ssec.wisc.edu/tiles/globalvis/{z}/{x}/{y}.png

Here is the same basemap with an overlay that uses **dynamic layers to display country boundaries**.
https://mappingsupport.com/p2/gissurfer.php?center=37.337256,-97.558594&zoom=4&basemap=Global_visible&overlay=Country&data=basemap^name=Global_visible^url=https://realearth.ssec.wisc.edu/tiles/globalvis/{z}/{x}/{y}.png||overlay^name=Country^url=https://gis.ngdc.noaa.gov/arcgis/rest/services/reference/world_countries_overlay/MapServer^layers=0,1^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.5}}}},{"ID":1,"source":{"type":"mapLayer","mapLayerId":1},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.5}}}}]

RealEarth data that is solid satellite imagery is likely best displayed as a basemap. Other RealEarth data is best displayed as an overlay. For example, here is a map that shows snow depth.
https://mappingsupport.com/p2/gissurfer.php?overlay=Snow_cover&data=overlay^name=Snow_cover^url=https://realearth.ssec.wisc.edu/tiles/SNOWDEPTH24/{z}/{x}/{y}.png

If you watched the video showing how to use the data parameter to display GIS data, then here is another one of the RealEarth example maps I showed. This map includes two overlay layers that show country outlines and state outlines. Both of those overlays use dynamic layers to restyle the data. There is another PDF file and also a video that shows you step-by-step how to use dynamic layers. If you can cut-and-paste then you can use dynamic layers in your own GISsurfer maps.

https://mappingsupport.com/p2/gissurfer.php?center=38.580940,-98.173828&zoom=4&basemap=Night_lights&overlay=State_lines,Country&data=basemap^name=Night_lights^url=https://realearth.ssec.wisc.edu/tiles/DNB-ClearView/{z}/{x}/{y}.png||overlay^name=Country^url=https://gis.ngdc.noaa.gov/arcgis/rest/services/reference/world_countries_overlay/MapServer^layers=0,1^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.5}}}},{"ID":1,"source":{"type":"mapLayer","mapLayerId":1},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.5}}}}]||overlay^name=State_lines^url=https://gis.blm.gov/arcgis/rest/services/Cadastral/BLM_Natl_PLSS_CadNSDI/MapServer^layers=0^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSFS","outline":{"type":"esriSLS","style":"esriSLSSolid","color":[0,255,255,255],"width":1.0}}}}}]

11. Display data hosted on WMS servers

Here is the basic syntax for displaying data that is hosted on a WMS server.
&data=overlay^name=_____^url=https://_____^service=wms^version=_____^layers=_____
&data=basemap^name=_____^url=https://_____^service=wms^version=_____^layers=_____

You make up a value for the "name" but to get information to fill in the rest of the blanks you will need to look at a GetCapabilities file.

a. Mesonet

Iowa State University is hosting a variety of environmental GIS data that is part of the mesonet program. https://mesonet.agron.iastate.edu/GIS/

If you open https://mesonet.agron.iastate.edu/GIS/goes.phtml and scroll down to the section titled "OGC Web Map Service", then you will see 9 links. To access the GetCapabilities information you need to add

VER=1.1.1&SERVICE=WMS&REQUEST=GetCapabilities

to the end of any of those links. For example, for GOES West water vapor imagery, make a link like so:
https://mesonet.agron.iastate.edu/cgi-bin/wms/goes/west_wv.cgi?VER=1.1.1&SERVICE=WMS&REQUEST=GetCapabilities

We now know 1.1.1 is the value for version. You will also see some WMS servers use version 1.3.0. To get the other information needed to display this water vapor data with GISsurfer, **open the above GetCapabilities link**. If you are new to the kind of data that is displayed then I suggest you **start at the bottom of the file**.

Find the line "OnlineResource xlink". This gives you the url for all the data described in this GetCapabilities file. But the url to use in the GISsurfer map link is only part of the value that is displayed. **You may need to experiment.** The url for the GISsurfer map link is either

https://mesonet.agron.iastate.edu/cgi-bin/mapserv/mapserv
or
https://mesonet.agron.iastate.edu/cgi-bin/mapserv/mapserv?map=/opt/iem/data/wms/goes/west_wv.map

Continue reading up in the file until you see a line that starts with "<Layer" followed by a line with name tags. The name line you will see is: <Name>west_wv_4km</Name>
This name is the value for ^layers= in the GISsurfer map link. Usually the name tags have some kind of text but sometimes it will just be a number.

With just a bit of experimentation regarding the url value, I was able to make this map link:
https://mappingsupport.com/p2/gissurfer.php?overlay=GOES_West_water_vapor&data=overlay^name=GOES_West_water_vapor^url=https://mesonet.agron.iastate.edu/cgi-bin/mapserv/mapserv?map=/opt/iem/data/wms/goes/west_wv.map^service=wms^version=1.1.1^layers=west_wv_4km

Here is the same map with a second overlay that uses **dynamic layers to display state lines**.
https://mappingsupport.com/p2/gissurfer.php?overlay=GOES_West_water_vapor,State_lines&data=overlay^name=GOES_West_water_vapor^url=https://mesonet.agron.iastate.edu/cgi-bin/mapserv/mapserv?map=/opt/iem/data/wms/goes/west_wv.map^service=wms^version=1.1.1^layers=west_wv_4km||overlay^name=State_lines^url=https://gis.blm.gov/arcgis/rest/services/Cadastral/BLM_Natl_PLSS_CadNSDI/MapServer^layers=0^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSFS","outline":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":2}}}}}]

Often a GetCapabilities file will describe multiple GIS layers. Each layer description will start with a line that begins "<Layer" followed by a line <Name>_____</Name>. Also, you will often see a link that displays an image with a legend.

Here is a second link to Mesonet with access to more GIS data including **individual channels from the GOES satellites**. https://mesonet.agron.iastate.edu/ogc/
Scroll down to the section titled "Web Map Service (WMS)". To see the GetCapabilities information you will need to add the following at the end of each link:

VERSION=1.1.1&SERVICE=WMS&REQUEST=GetCapabilities

b. NASA

GISsurfer can display satellite via NASA's Global Imagery Browse Services (GIBS). The follow link has general information on GIBS.
https://www.earthdata.nasa.gov/eosdis/science-system-description/eosdis-components/gibs

Here is the link to use for the WMS GetCapabilities information:
https://gibs.earthdata.nasa.gov/wms/epsg3857/best/wms.cgi?VERSION=1.3.0&SERVICE=WMS&REQUEST=GetCapabilities

The value for version to use in GISsurfer map links is ^version=1.3.0

In the GetCapabilities file, the lines that start "<OnlineResource" show that the url to use in GISsurfer map links is ^url=https://gibs.earthdata.nasa.gov/wms/epsg3857/best/wms.cgi

The last piece of information you need is a layer name. There are two ways to do that. First, as described in the prior section your could look through the GetCapabilities file. Second, you could use this page: https://nasa-gibs.github.io/gibs-api-docs/available-visualizations/. Scroll down about halfway to a list of items beginning with a "+" sign. Click on any item to expand it. Now look at the column titled "Name / Identifier". Each entry in that column includes two kinds of text. The text that is a clickable link is the value to use for ^layers= in a GISsurfer map link.

For example, if you expand "Geostationary" then you can display color images of the earth. Here is a map that displays GOES-West_ABI_GeoColor as a basemap.
https://mappingsupport.com/p2/gissurfer.php?center=37.000000,-100.000000&zoom=4&basemap=GOES_West_earth&data=basemap^name=GOES_West_earth^url=https://gibs.earthdata.nasa.gov/wms/epsg3857/best/wms.cgi^SERVICE=WMS^VERSION=1.3.0^layers=GOES-West_ABI_GeoColor

Below is the same map but with dynamic layers used to add country boundaries and state lines.

https://mappingsupport.com/p2/gissurfer.php?center=37.000000,-100.000000&zoom=4&basemap=GOES_West_earth&overlay=State_lines,Country&data=basemap^name=GOES_West_earth^url=https://gibs.earthdata.nasa.gov/wms/epsg3857/best/wms.cgi^SERVICE=WMS^VERSION=1.3.0^layers=GOES-West_ABI_GeoColor||overlay^name=Country^url=https://gis.ngdc.noaa.gov/

arcgis/rest/services/reference/world_countries_overlay/MapServer^layers=0,1^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.5}}}},{"ID":1,"source":{"type":"mapLayer","mapLayerId":1},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSLS","style":"esriSLSSolid","color":[255,0,0,255],"width":1.8}}}}]||overlay^name=State_lines^url=https://gis.blm.gov/arcgis/rest/services/Cadastral/BLM_Natl_PLSS_CadNSDI/MapServer^layers=0^dynamicLayers=[{"ID":0,"source":{"type":"mapLayer","mapLayerId":0},"drawingInfo":{"renderer":{"type":"simple","symbol":{"type":"esriSFS","outline":{"type":"esriSLS","style":"esriSLSSolid","color":[0,255,255,255],"width":1.5}}}}}]

Tip: You can put the value for the data parameter into a text file, put the text file online (**free hosting on Google Drive!**) and then make a *much* shorter map link. Don't know how? See the last section of this PDF. There is also a video to walk you through the process.

If you would like to display data from the **European Copernicus project**, including data from the Sentinel satellites, then open the following page and look for the WMS link.
https://land.copernicus.eu/global/web-services

c. WMS options and default values

If you want to dig deeper into the options for displaying WMS data with GISsurfer, then please open the following link to the WMS section of the Leaflet documentation. (Close the message that appears on the screen in order to see the documentation.)
https://leafletjs.com/reference.html#tilelayer-wms

12. Display georeferenced JPG and PNG files

Here is a GISsurfer map link that uses the data parameter to display a georeferenced JPG.

https://mappingsupport.com/p2/gissurfer.php?data=Mason_Lake^https://mappingsupport.com/p2/kmz_demo/georeference_demo/Mason_Lake.jpg^47.394631,-121.605349,47.442195,-121.517458

The georeference data is the latitude longitude for the four edges of the image. **That data must start at the bottom edge and go around the JPG or PNG clockwise (bottom,left,top,right).**

A GISsurfer map can display multiple georeferenced JPG or PNG files. The specifications for the georeferenced images can either be in the map link as shown above or in a TXT file.

13. Display GPX files

Here is a GISsurfer map link that uses the data parameter to display the **track data** from a GPX file. The next section shows how you can host your GPX files for free on Google Drive.

https://mappingsupport.com/p2/gissurfer.php?basemap=USA_scanned_topo&data=https://mappingsupport.com/gpx/Bandera.gpx

Since there is no center and zoom parameters the map is automatically centered and zoomed so all the GPX track data appears on the user's screen.

Currently GISsurfer does not display GPX route or waypoint data.

To display data from multiple GPX files use an end-of-line indicator after each file.
https://mappingsupport.com/p2/gissurfer.php?**data=**https://___.gpx||https://___.gpx

You can also specify GPX files in a TXT file and then make a GISsurfer map link with the data parameter pointing to where the TXT file is online.

The GPX track will be displayed using the **default line style** which is red and two pixels wide. Here is an example of using the 'line' command to change the line style. One of the built-in overlays showing contour lines is also turned 'on'. Note the end-of-line indicator ||.

https://mappingsupport.com/p2/gissurfer.php?basemap=USA_imagery&overlay=USA_main_contour_lines&data=line=on^color=ffff00^width=4||https://mappingsupport.com/gpx/Bandera.gpx

14. Display KML or KMZ files

GISsurfer does not presently support KML or KMZ files. Support for those file types might be added in a future update.

15. Free hosting for TXT, GPX and JPG files

You can host your TXT, GPX and JPG files for free on **Google drive** and use those files with GISsurfer. Note that I am **not** talking about "Google cloud" which is a different critter.

1. Sign in to Google drive
https://drive.google.com/drive/my-drive

2. I recommend you make a folder to hold your files.

3. Upload a TXT, GPX or JPG file

4. Right click the filename and select "Get link"
Change "Restricted" to "Anyone with the link"
Copy and save the link. Here is an example link for a TXT file.
https://drive.google.com/file/d/14bD6LvccM1Z-dx9lvJ1H8vMjEcrgB-8G/view?usp=sharing

5. Use the following website to change the 'share' link into the direct link.
https://sites.google.com/site/gdocs2direct/

Here is an example of the 'direct' link you will get.
https://drive.google.com/uc?export=download&id=14bD6LvccM1Z-dx9lvJ1H8vMjEcrgB-8G

6. Make a value for the data parameter.
&data=_____^_____

The first part is a name that **you make up** and give it a value that ends in **txt or gpx or jpg**. Use an underline instead of a space in the file name. **It will likely help you stay organized if the name is the same as the file name you uploaded to Google Drive**, however that is not required.

The second part is the direct link to your file on Google Drive.

6. Make a GISsurfer map link with the data parameter
https://mappingsupport.com/p2/gissurfer.php?overlay=State_boundary,Weather_watch_warning&data=USA_weather_txt^https://drive.google.com/uc?export=download&id=14bD6LvccM1Z-dx9lvJ1H8vMjEcrgB-8G