TideBed : Tide datum relationship database of Korea
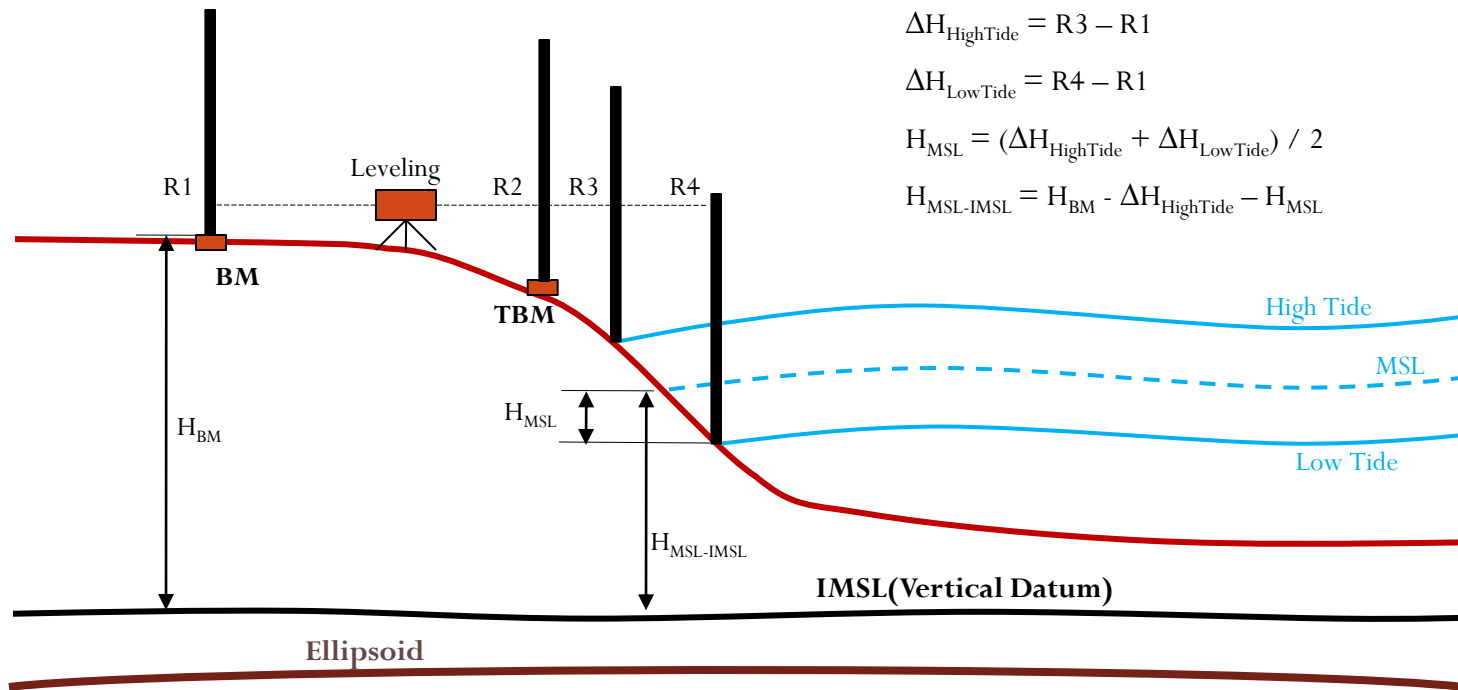
What is Tide Bed?

- Tide Bed is a database of relationships among Mean Sea Level(MSL), Datum Level(DL) and Mean Sea Level at Incheon bay(IMSL) which is vertical datum of Korean geodetic datum.

- Tide Bed will be constructed as fine cell structure(10m mesh).

- Every cell contains
  - Separation between MSL and DL
  - Separation between MSL and IMSL
  - Harmonic constants of
    4 major constituents

- Geo-spartial extends of Database
  - Inner part of Korea Exclusive
    Economic Zone

Why is Tide Bed needed?

- Hydrographical survey data need tide calibration
  - For consistency of calibration work, preprogrammed database of tidal corrector is needed
- Most of bathymetric survey data was compiled as Nautical Chart, but it can not reflect real topological shape and water volume.
  - Chart Datum Level = Approximation Lower Low Water
  - More shallow data are given priority in chart data selection(shoal biased)
- Correct ocean topology data is needed in various fields like as Ocean numerical modeling, coastal development, resource assessment and legal boundary delimitation.

Relationships among three tidal datum

- In coastal area, the relationships among three tidal datum can be made out by
  - Leveling between land BM and Tidal BM
  - Intensive analysis on observed tide data

$$\Delta H_{HighTide} = R3 - R1$$

$$\Delta H_{LowTide} = R4 - R1$$

$$H_{MSL} = (\Delta H_{HighTide} + \Delta H_{LowTide}) / 2$$

$$H_{MSL-IMSL} = H_{BM} - \Delta H_{HighTide} - H_{MSL}$$

Cell contents

Cell Attributes	Dimensions	Type	Size(Byte)
M_2 Amplitude	X, Y	float	4
M_2 Phase	X, Y	float	4
S_2 Amplitude	X, Y	float	4
S_2 Phase	X, Y	float	4
K_1 Amplitude	X, Y	float	4
K_1 Phase	X, Y	float	4
O_1 Amplitude	X, Y	float	4
O_1 Phase	X, Y	float	4
Spring Range	X, Y	float	4
Mean High Tide Interval of M_2	X, Y	float	4
MSL-DL offset	X, Y	float	4
MSL-IMSL offset	X, Y	float	4
Total			48

* Database was compiled as NetCDF format

Data processing for DB generation

- Controlled point
  - We use 407 points of tidal observed data from observed data analysis, but they was not sufficient to reconstruct detail tidal characteristic of coastal area.
  - Add 1190 controlled points as input data for more accurate and precise distribution of tidal characteristics
- Optimal interpolation with model data
  - For more realistic tidal corrector distribution on outer sea, Optimal interpolation was performed.
 - NAO.99jb was used as background fields.
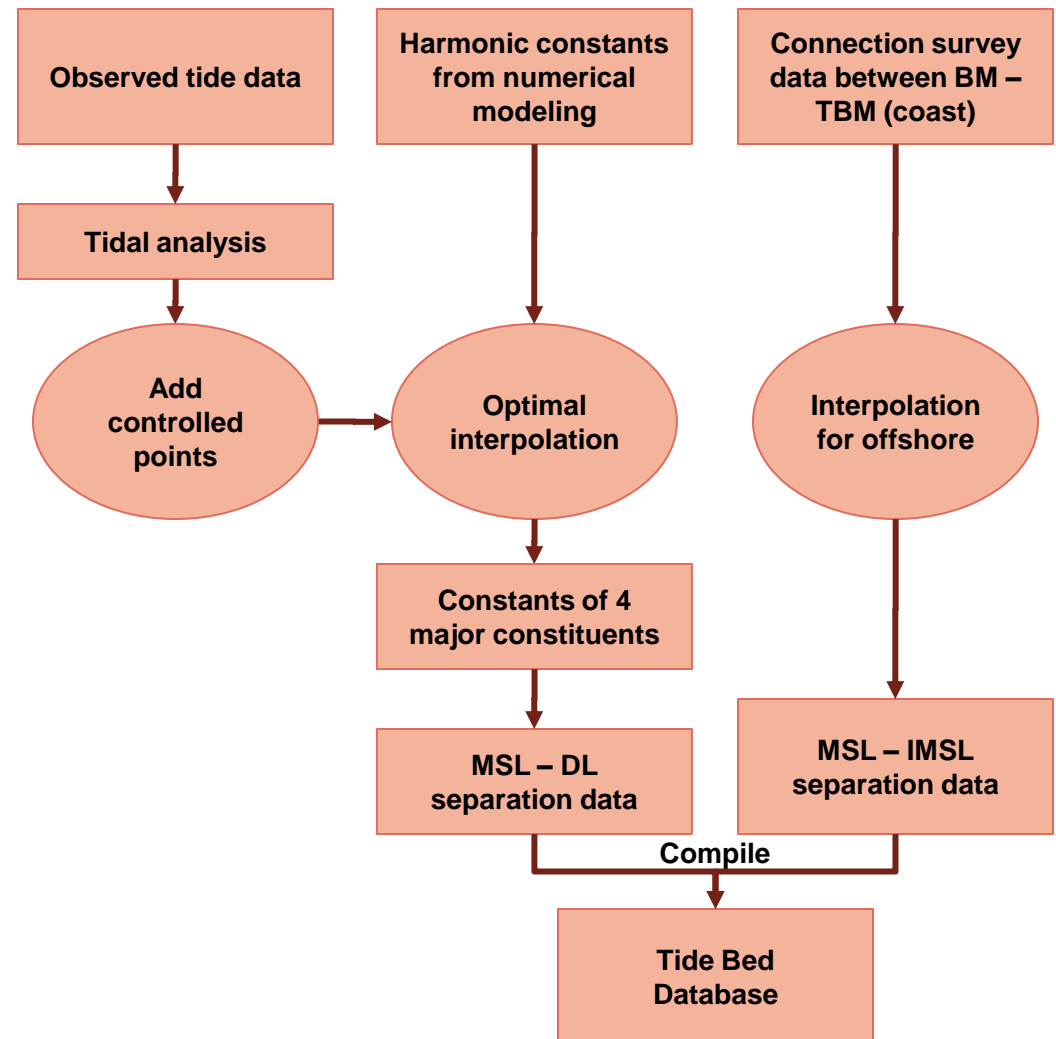
Data processing for DB generation(cont'd)

- Create separations among three tidal datum
  - Coastal area
    - MSL-DL separation calculated as sum of amplitude of 4 major tidal constituents.
    - MSL-IMSL separation estimated from results of connection survey between Land BM and Tidal BM.

  - Whole area
    - MSL-DL separation data of whole area can be made through optimal interpolation of observed(coastal) data and simulated data from numerical modeling
    - We assumed that MSL-IMSL separation of offshore would be zero, MSL-IMSL separation data made through spatial interpolation method
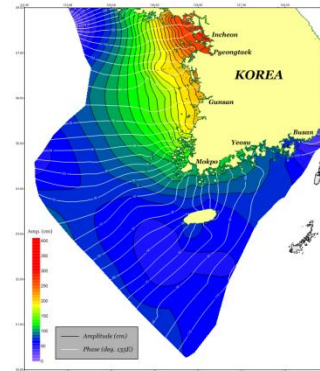
Acquired charts

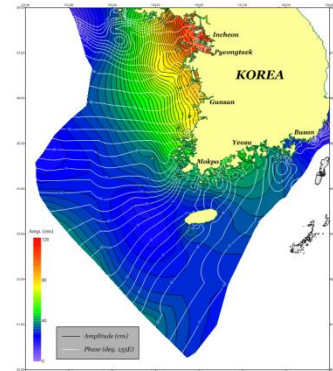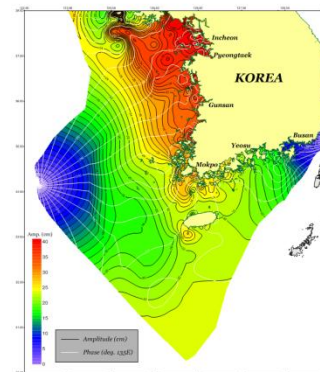- We obtain co-tidal chart as below
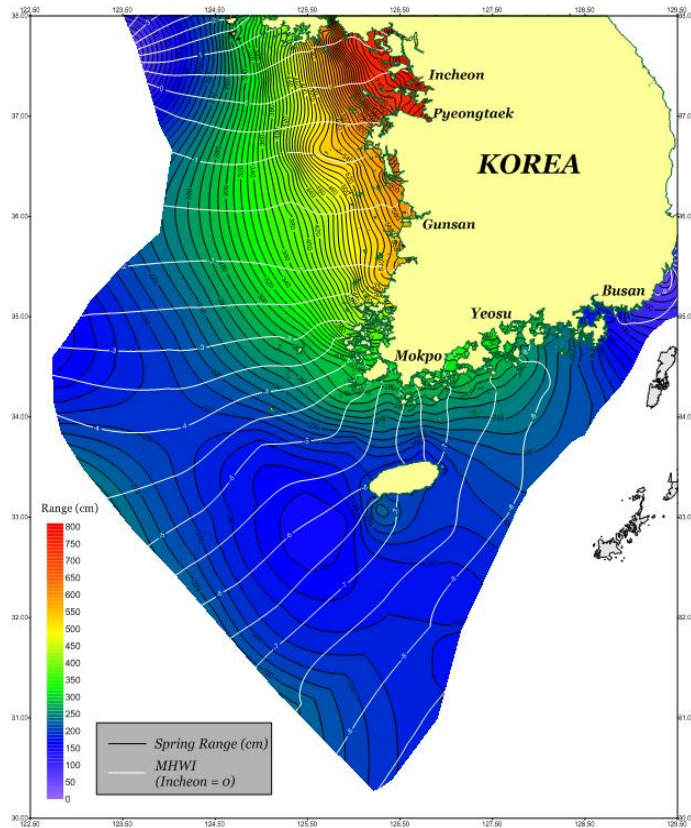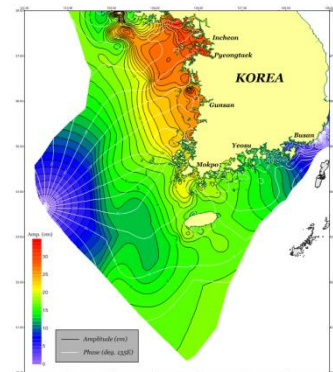
Future improvements

- Accuracy and uncertainty assessments

- Add new relationship between MSL and Ellipsoid

- Construct tidal harmonic constants database, consist on major 16 ~ 20 constituents

- Develop downloadable software or web-based tools for interacting with Tide Bed database

Questions?