

Historical Documents and Evidences of Dam Construction in the Eurim Lake Deposits in S. Korea

Ju-Yong KIM*

Associate Researchers : Dong-Yoon YANG, Wook-Hyun
NAHM, Sangheon YI, Jin-Young LEE, Sei-Sun HONG,
Jaesoo LIM, Jin Kwan LEE, Jincheul KIM

Quaternary Geology Research Group, KIGAM

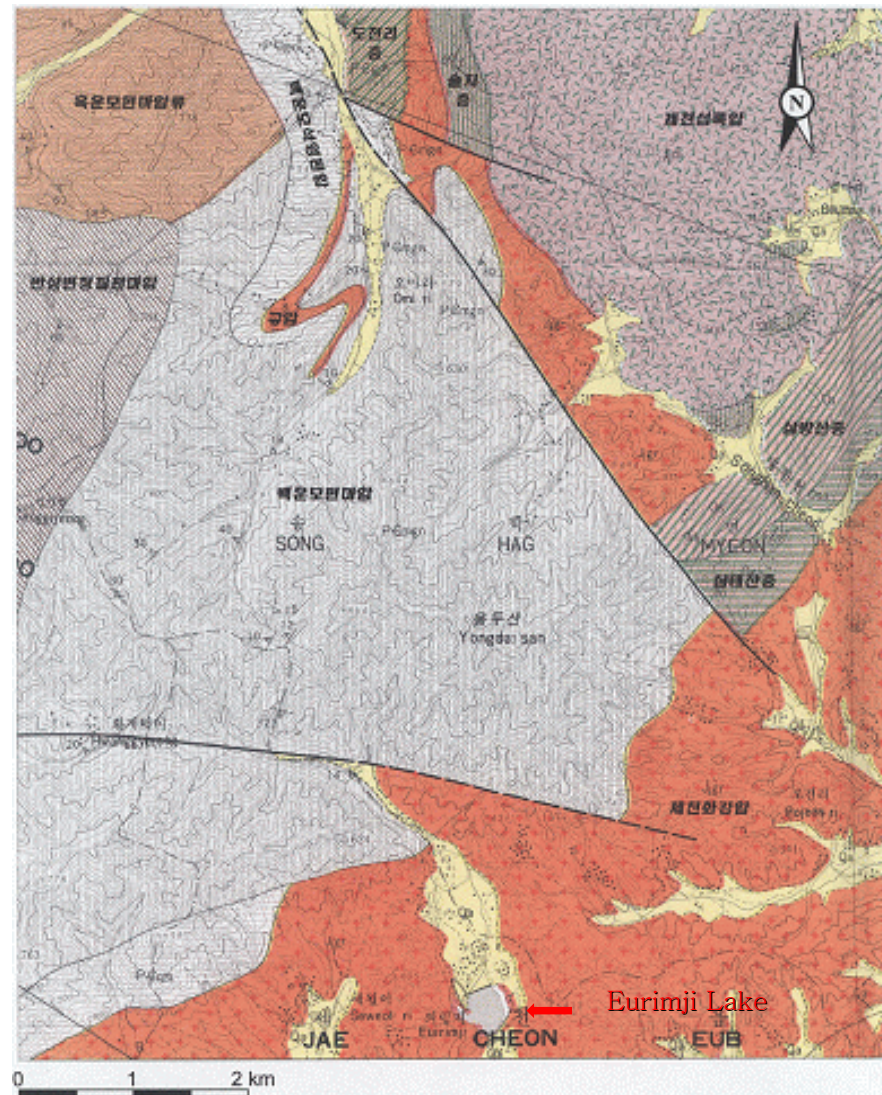
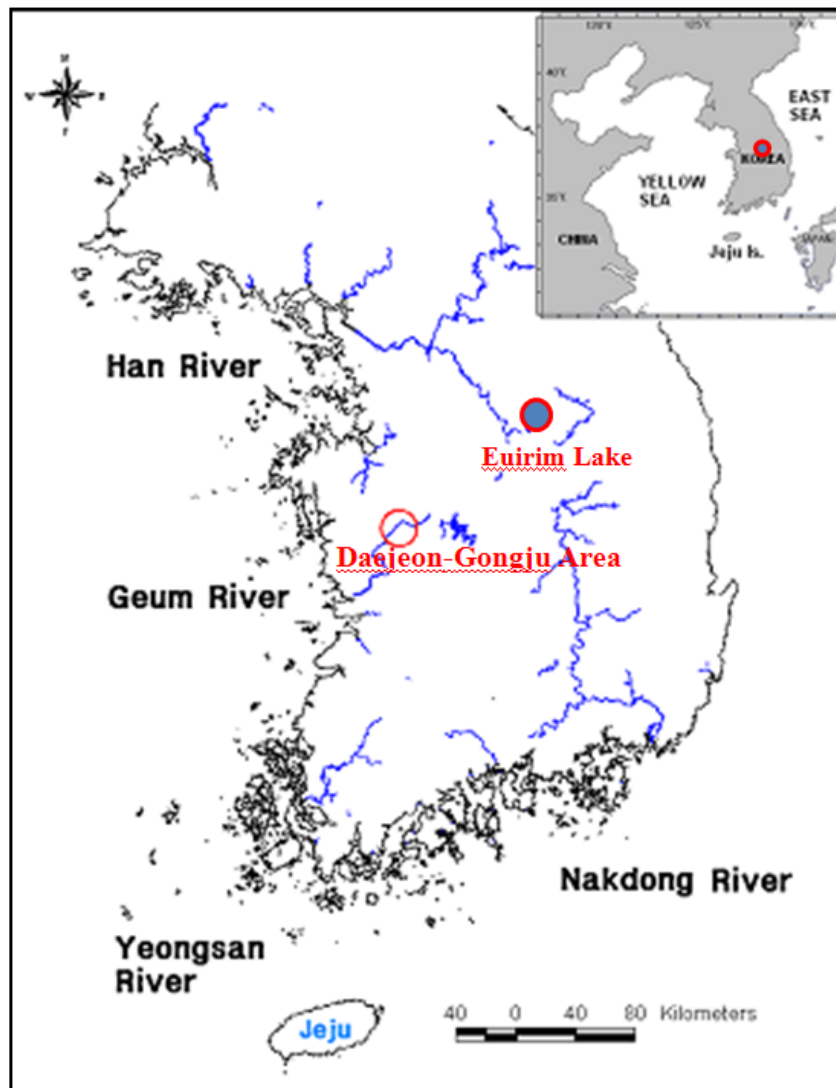
.kiy@kigam.re.kr

[+82-868-3056](tel:+82-868-3056)

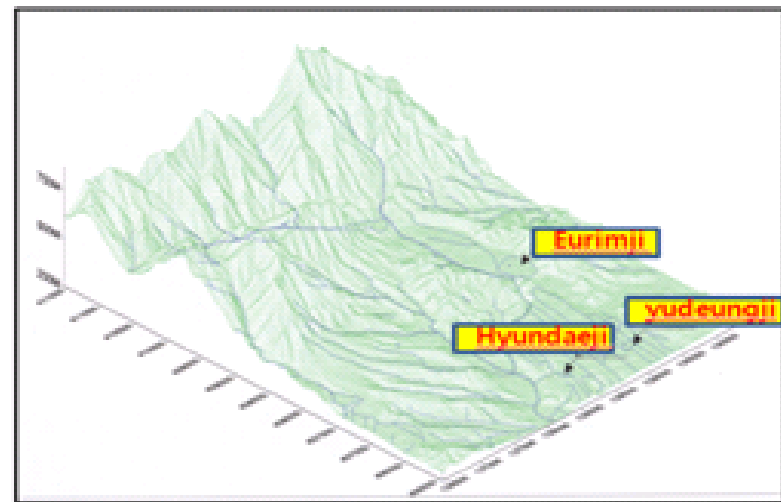
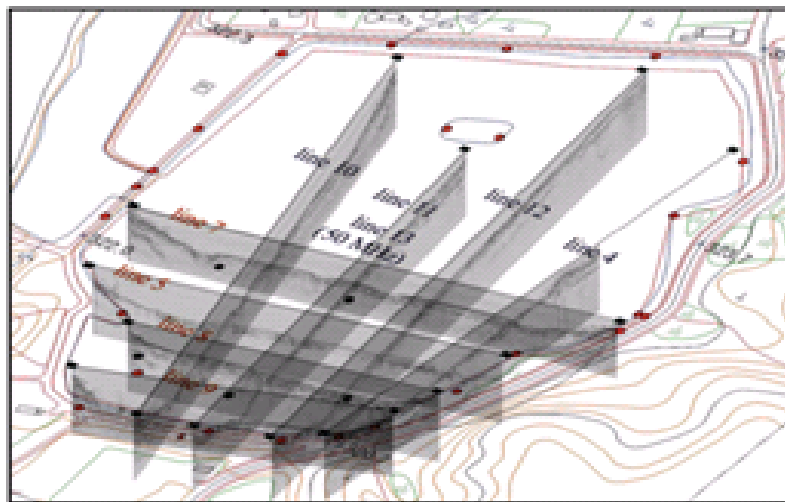
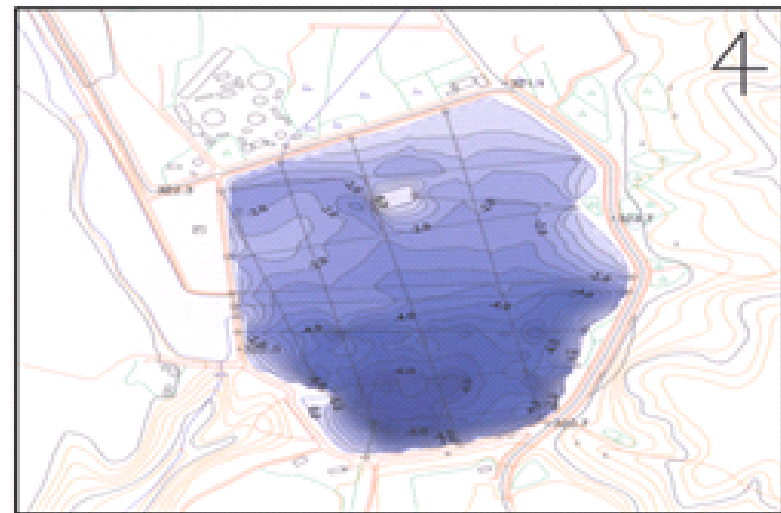
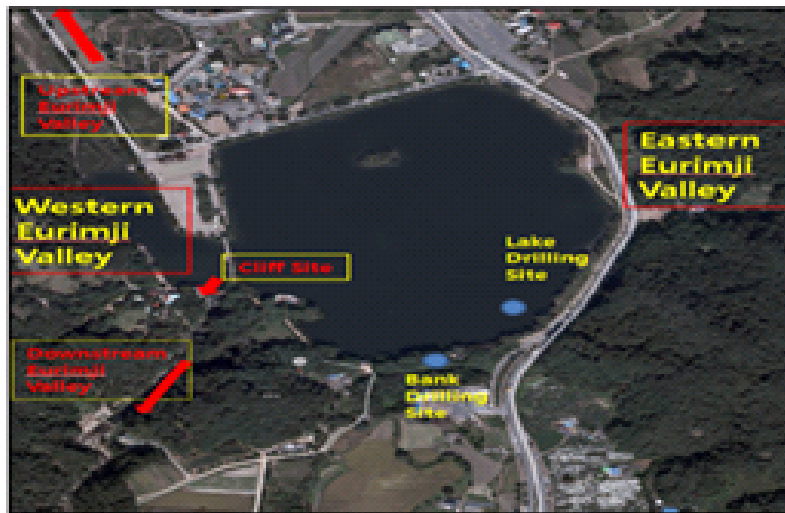
Trilateral Lake Research in the Far East



Eurimji Lake in Korea

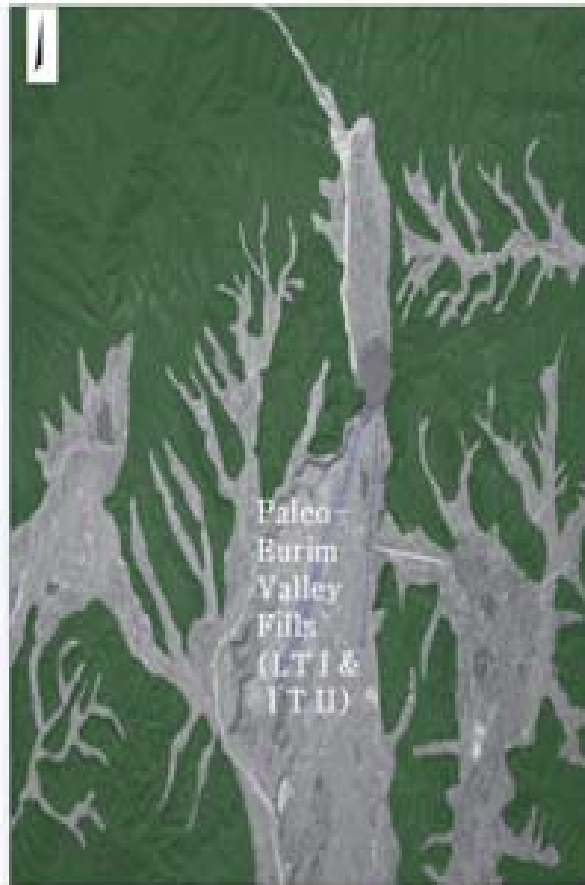


Eurimji Valley and lake investigation

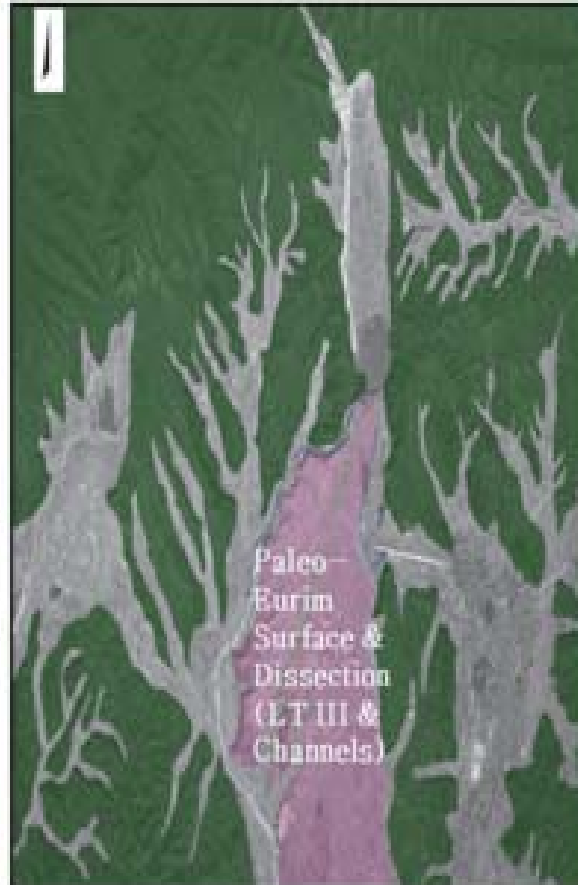


Landscape The landscape (satellite imagery: A), bathymetry (B), GPR profiles (C) and 3D topographic model (D) of the Eurim Lake.

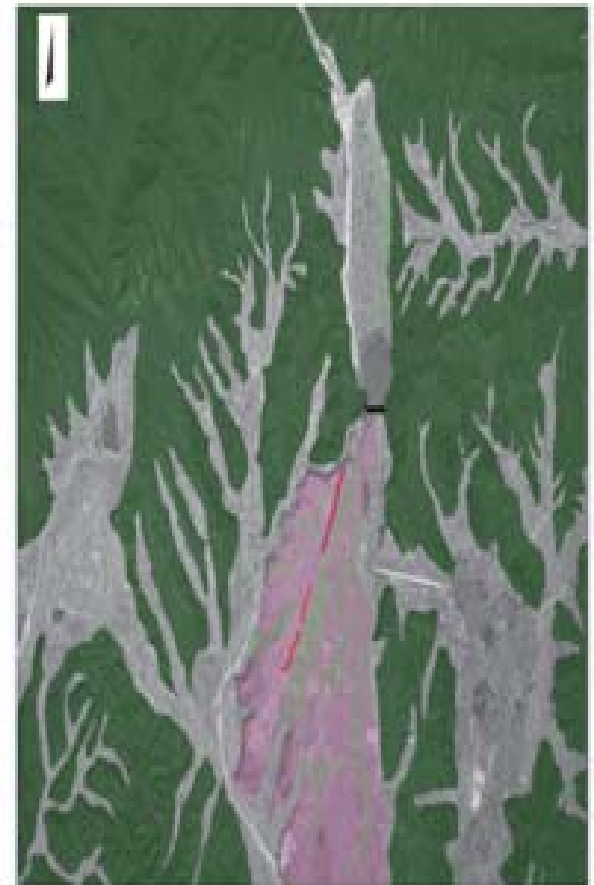
Eurimji Valley Development



1) Low (I) Surface at 15–20m (RH)
2) Low (II) Surface at 8–10m (RH)
Old Valley Fills and Fluvial Terrace Deposits (before the Last Glacial Max..)



3) Low (III) Surface at 5–6m (RH)
–Prevailing Alluvial Surface and Dissection of Alluvial Surface (the LGM~ Early~Mid, Holocene)



4) Natural Levees at 2–3m (RH)
–Dissection of Alluvial Surface and Artificial Dam and Discharges (Late Holocene, since the Late Bronze Age)

Historical Reservoir Dams

1. Major rice peddies were cultivated at slope margin, alluvial fan and floodplain since the Bronz Age in Korea.

2. Agricultural relics in Korea

1) Bronz Age : Jeojeonri (Andong),

2) Iron age (~ 2AD) : Majeonri(Nonsan), Mugeodong(Ulsan),
Kwanchangri(Boryeong), Yangjangri(Muan), Gubongri (Buyeo)

3) Old Kingdom age (after 2AD) : Byoggoliae (Kimiye, 330AD), Siive (gveongu, 429AD), Cheoniae(Youngcheon, , 531AD), Gonggeumji (Sangju, after 655AD), and Eurimji (laecheon, document-5c AD~6c AD/core-800AD), as large-scale dykes and reservoir dams, associated with civil engineering structure like stone- fortress.

Outlines of topics

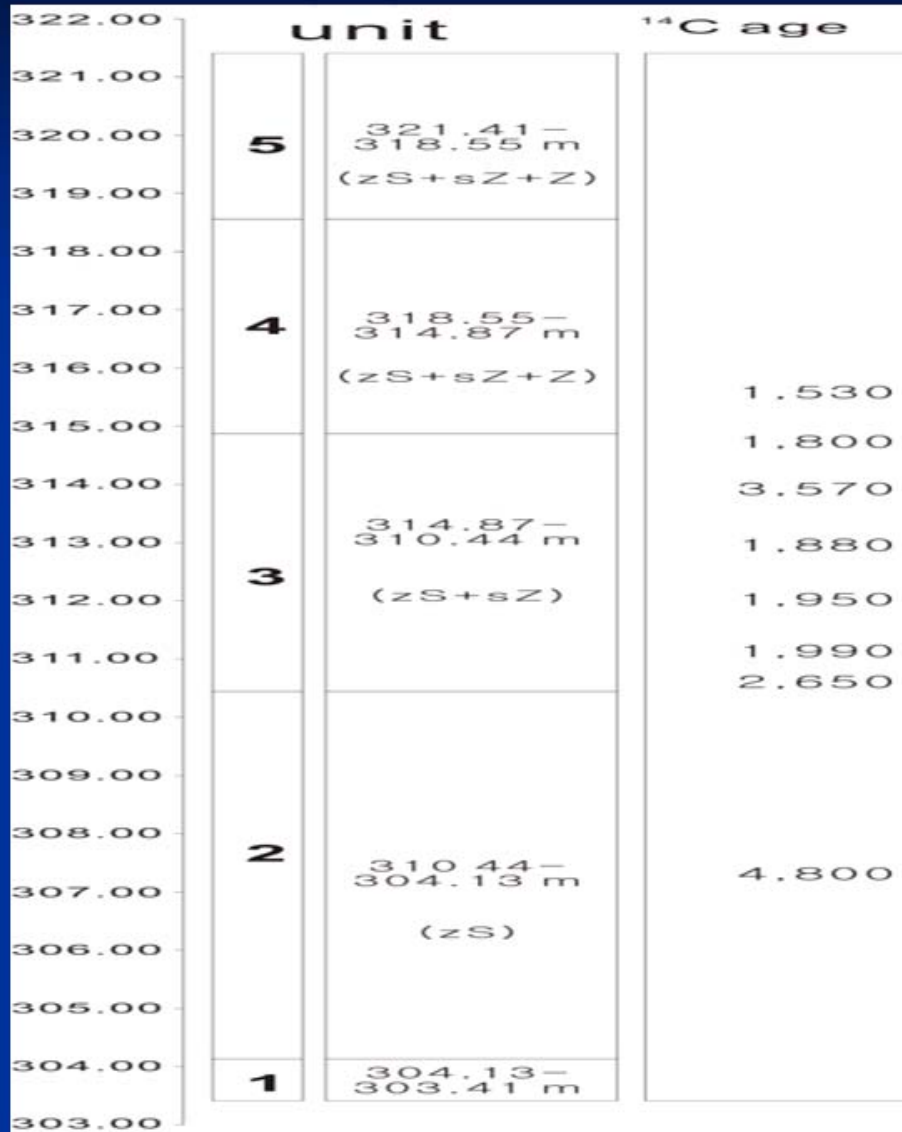
- * Eurimji Lake, as major reservoir, was constructed in the Ancient Kingdom age. **What is major construction age ? (9th C-AD or before)**
- * **What is the geological/ecological evidences ?**
- * **Climatic implication recorded in the Eurim Lake ?**

Short Coring Sites

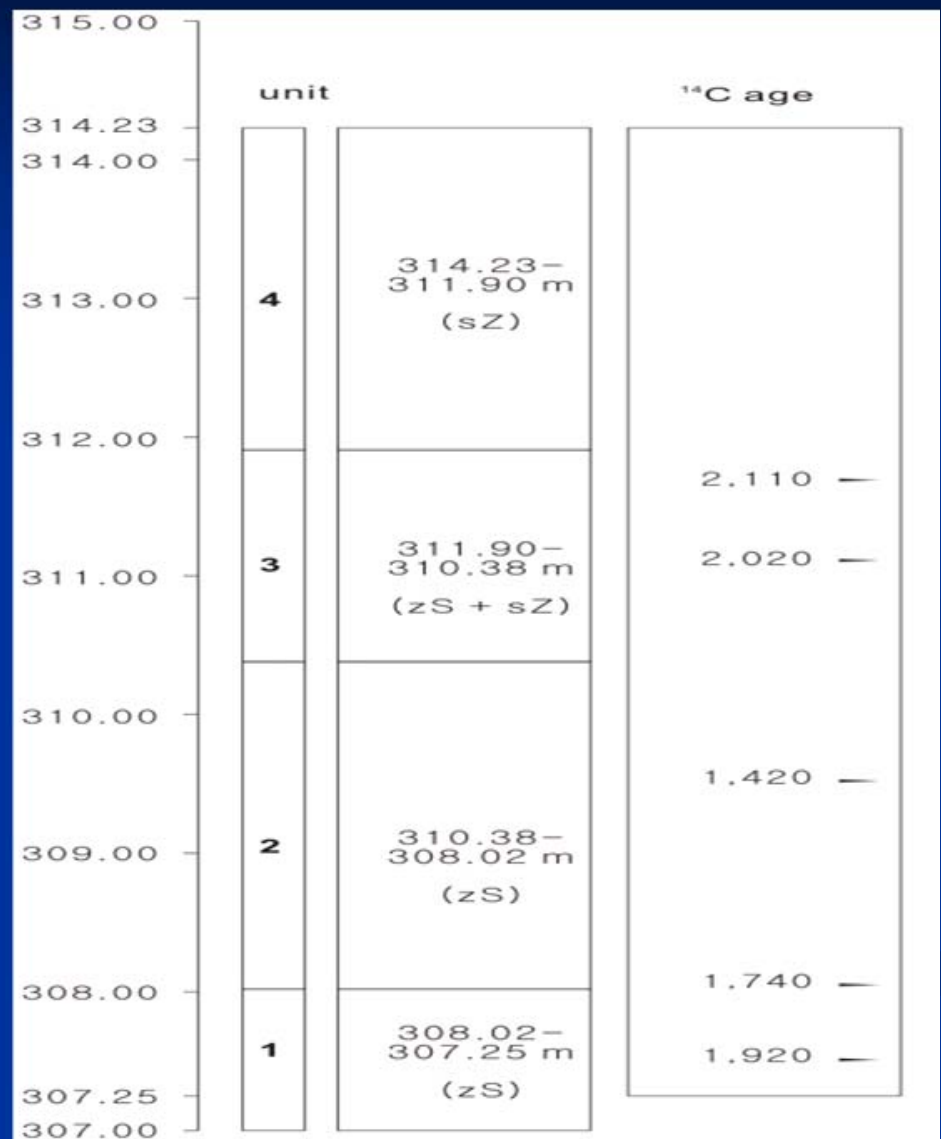
Location of Drilling Sites



Lithological Units



Bank Materials



Lake Sediments

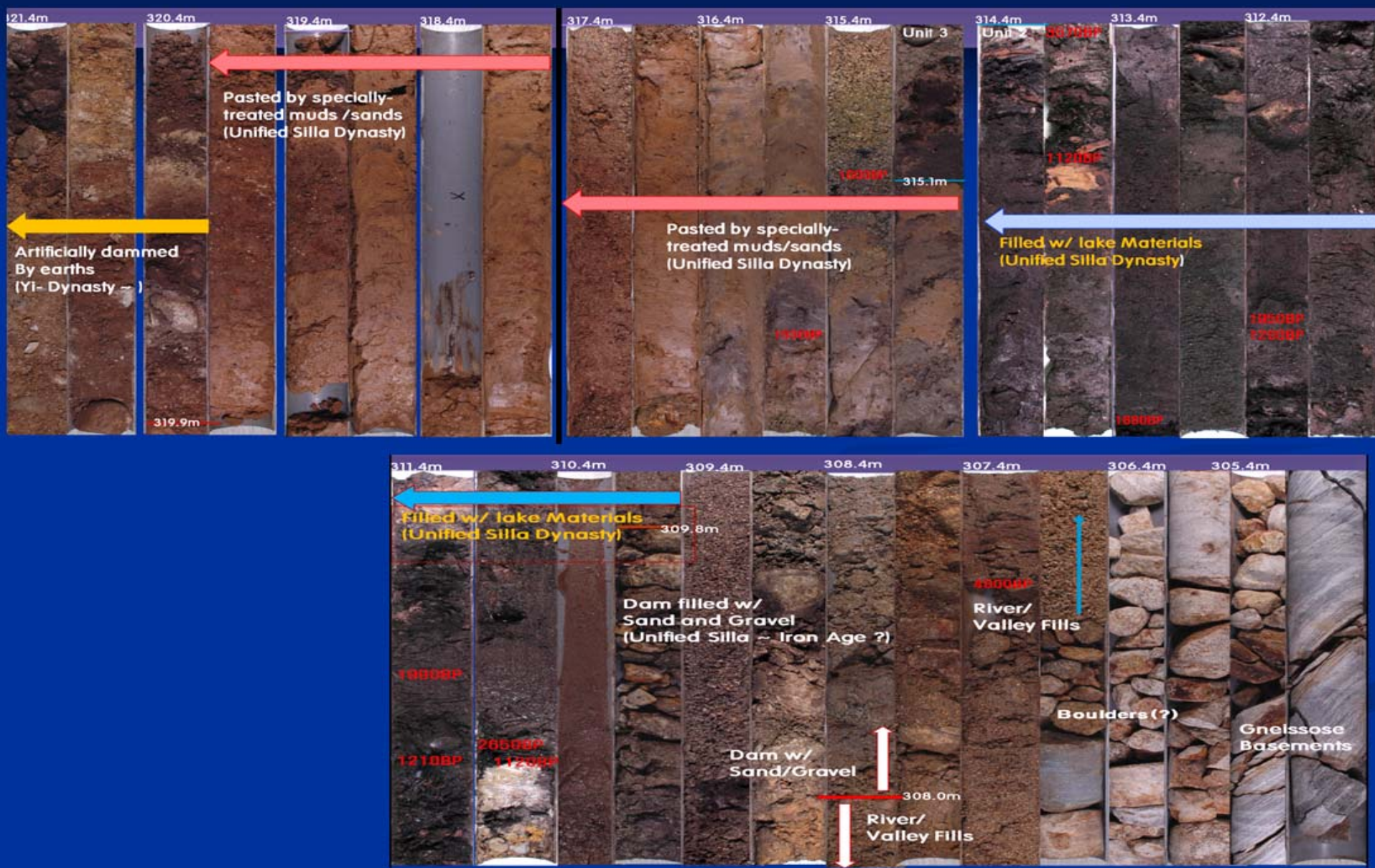
AMS radiocarbon dating of materials in core BH-1

Sample No.	Sample ID	Material	Altitude (m)	Age BP year	Error year	$\delta^{13}\text{C}$	Calendar year	Remark
EB-1	ISa080136	sediment bulk	315.56	1530	50	-22.8	AD 514 \pm 62	Upper part
EB-2	ISa080137	sediment bulk	314.73	1800	50	-23.2	AD 222 \pm 74	Middle part
EB-3	ISa080138	sediment bulk	313.92	3570	60	-19.7	BC 1913 \pm 91	Middle part
EB-4	IWd080274	plant fragment	313.78	1120	50	-26.9	AD 906 \pm 62	Middle part
EB-5	ISa080139	sediment bulk	312.96	1880	50	-21.4	AD 135 \pm 61	Middle part
EB-6	ISa080140	sediment bulk	312.03	1950	50	-22.2	AD 44 \pm 56	Middle part
EB-7	IWd080275	plant fragment	311.99	1200	50	-25.9	AD 810 \pm 70	Middle part
EB-8	ISa080141	sediment bulk	311.14	1990	50	-21.6	AD 1 \pm 52	Middle part
EB-9	IWd080276	plant fragment	311.03	1210	50	-24.9	AD 799 \pm 71	Middle part
EB-10	ISa080142	sediment bulk	310.61	2650	50	-23.0	BC 839 \pm 38	Middle part
EB-11	IWd080277	plant fragment	310.59	1120	50	-25.8	AD 906 \pm 62	Middle part
EB-12	ISa080143	sediment bulk	307.31	4800	60	-23.1	BC 3580 \pm 61	Lower part

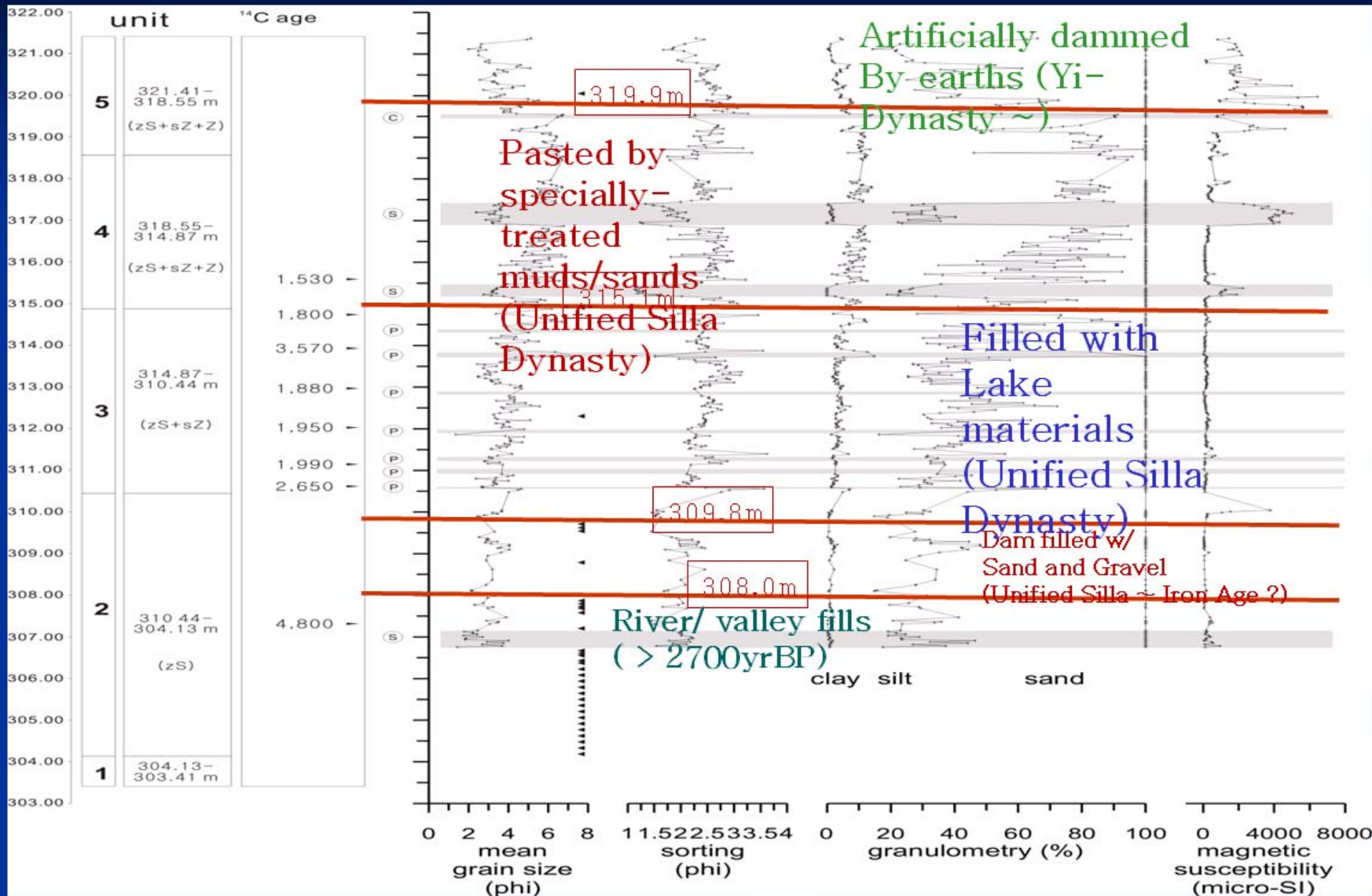
AMS radiocarbon dating of Sediment core EL-3-1

Sample No.	Sample ID	Material	Altitude (m)	Age BP year	Error	$\delta^{13}\text{C}$	Calendar year	Remark
EL-1	ISa090031	sediment bulk	311.7	2,110	50	-25.0	BC 143 \pm 68	disturbed layer
EL-2	ISa090032	sediment bulk	311.1	2,020	50	-25.1	BC 38 \pm 62	disturbed layer
EL-3	IWd090005	plant fragment	310.4	1,390	50	-26.5	AD 633 \pm 30	Stable layer
EL-4	ISa090033	sediment bulk	309.5	1,420	50	-26.0	AD 613 \pm 32	Stable layer
EL-5	ISa090034	sediment bulk	308.1	1,740	50	-23.6	AD 297 \pm 61	Stable layer
EL-6	ISa090035	sediment bulk	307.5	1,920	50	-24.0	AD 79 \pm 54	Stable layer

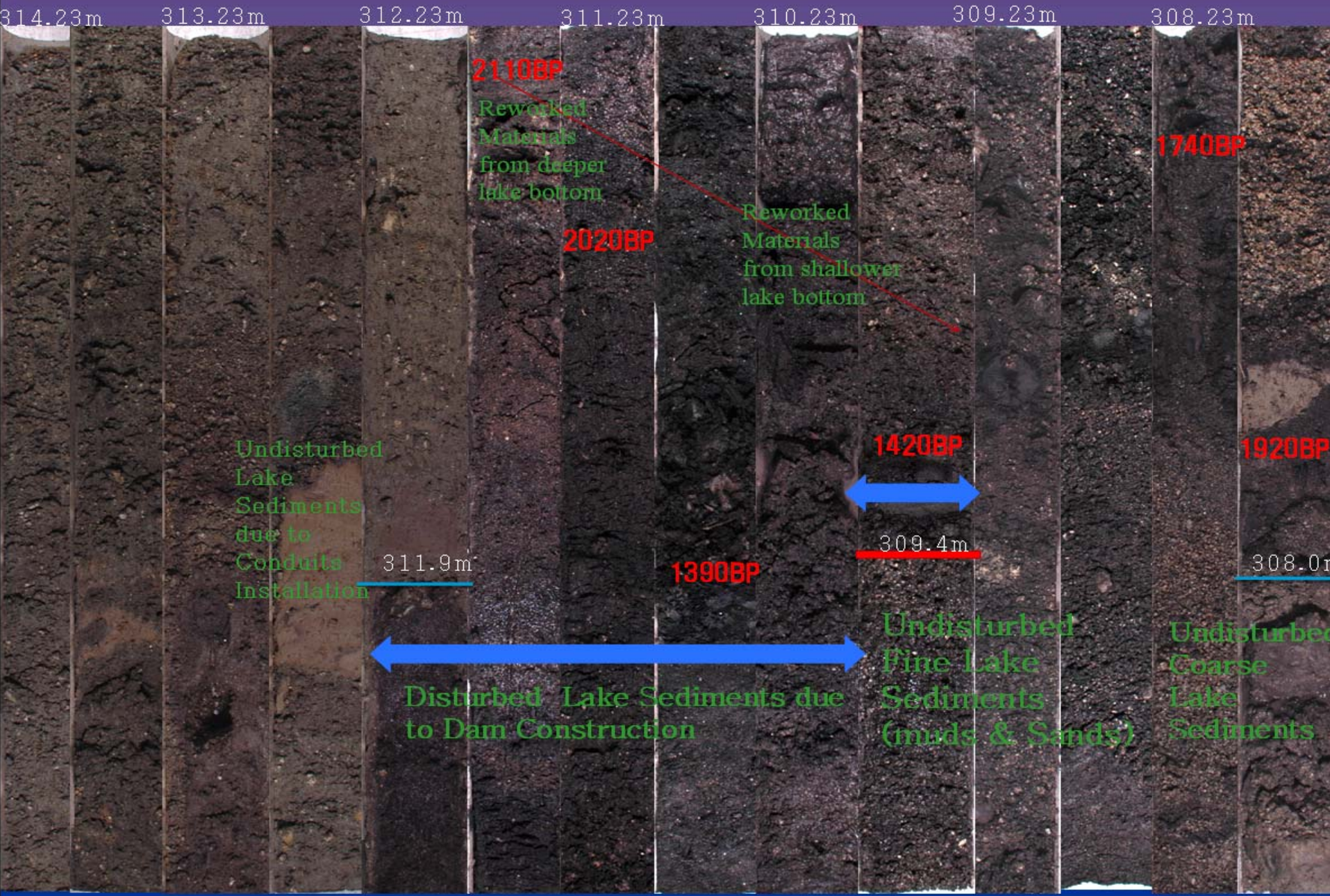
Core Materials in Embankments



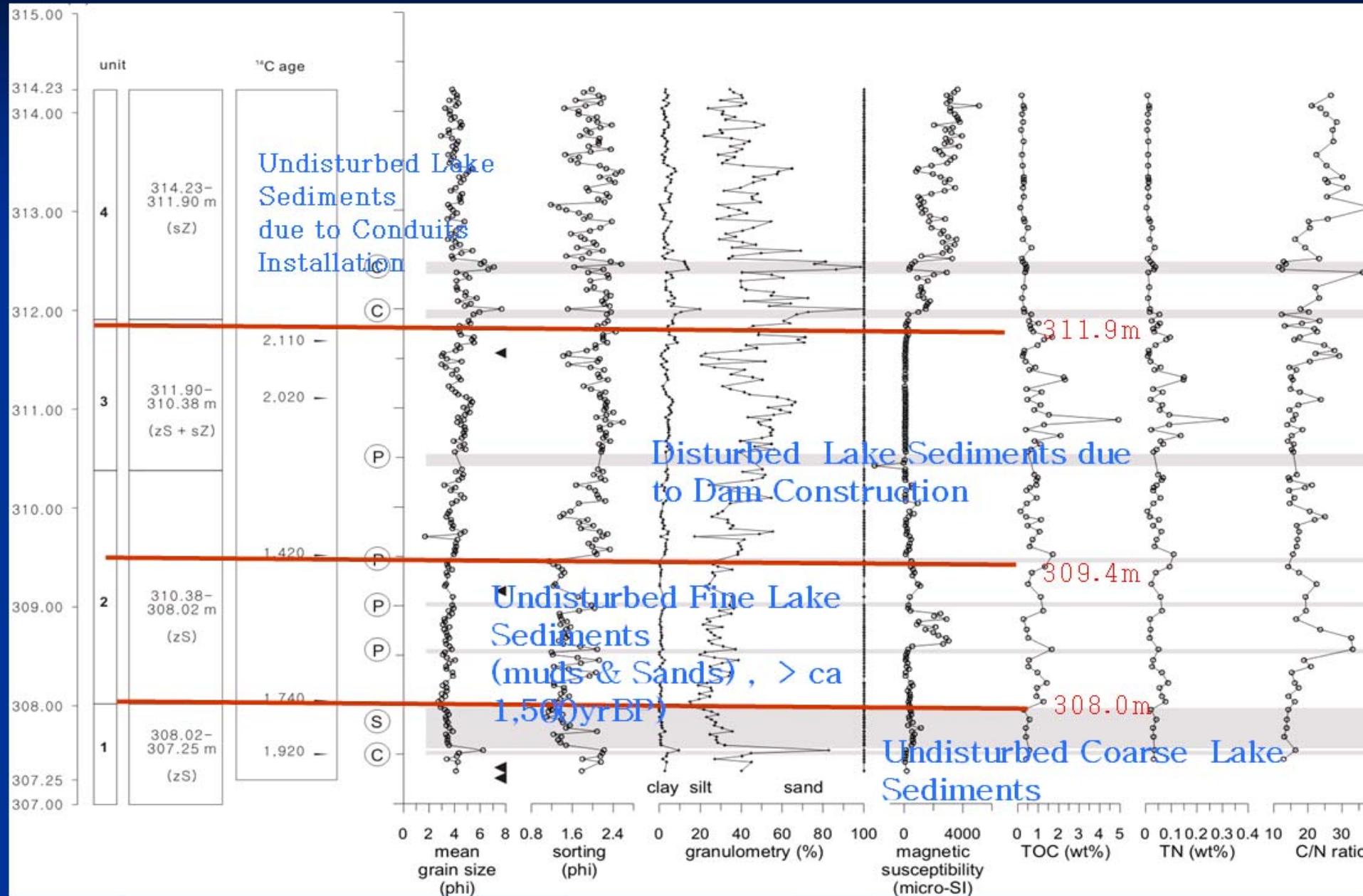
Results of Grain Size and MS (Bank)



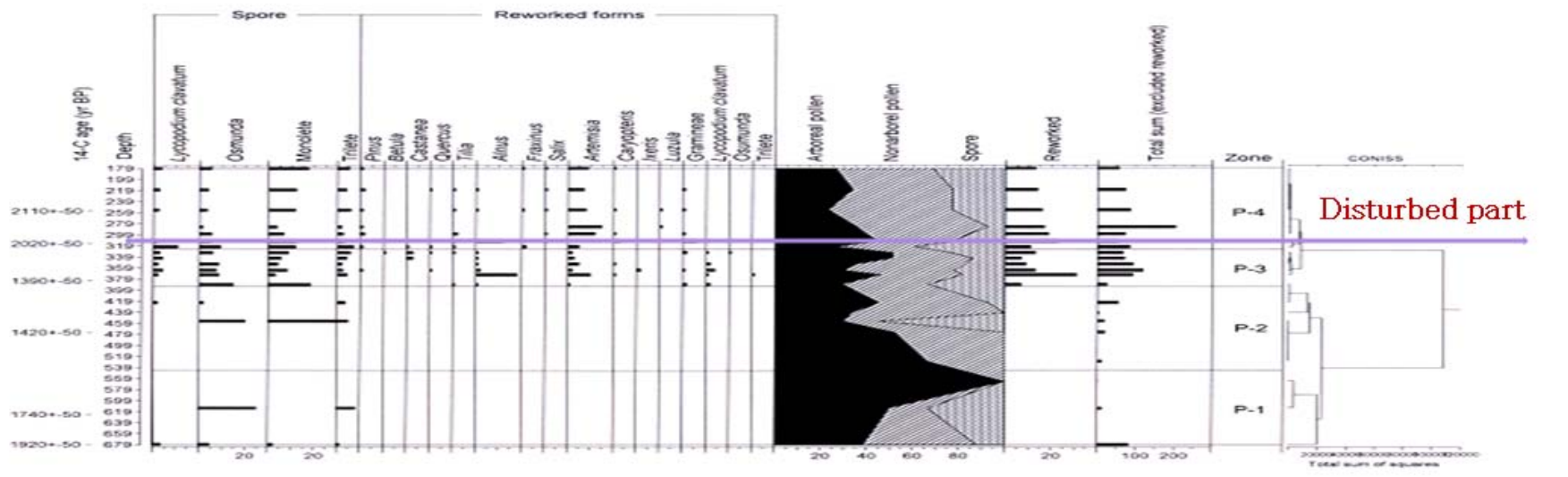
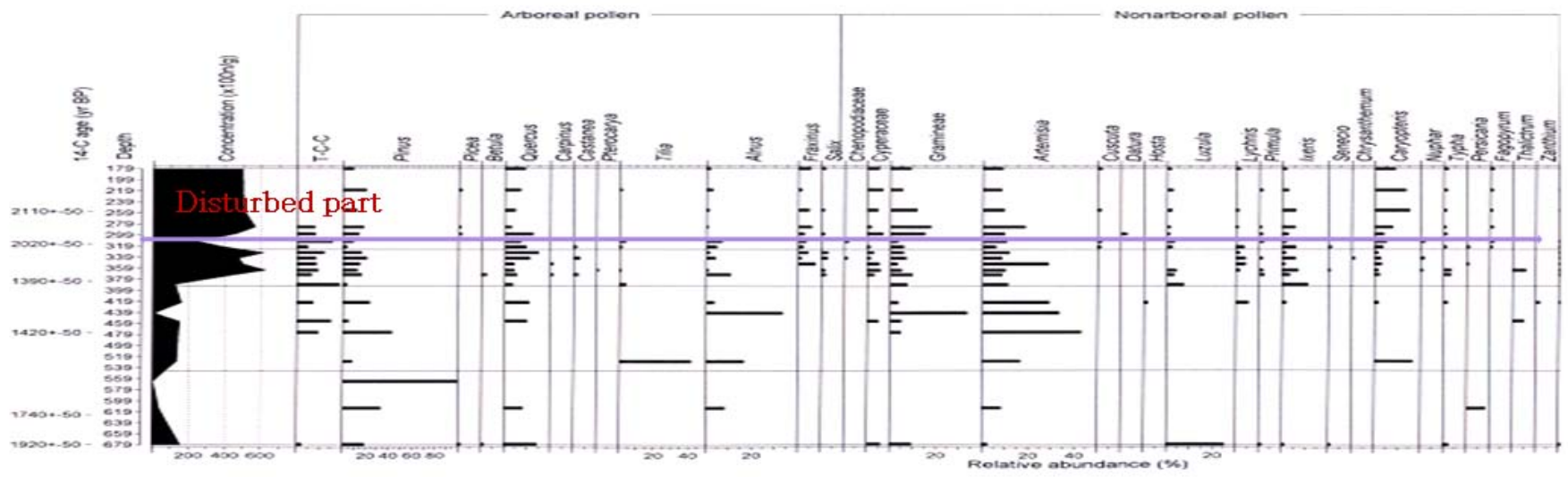
Core Sediments in Lake Bottom



Results of grain size, MS, TOC, C/N (Lake)



Palynological Evidences



Earliest Embankment as Stone Dyke

Lower part of Eurimji Bank Cores

309.9m 309.4m 308.9m

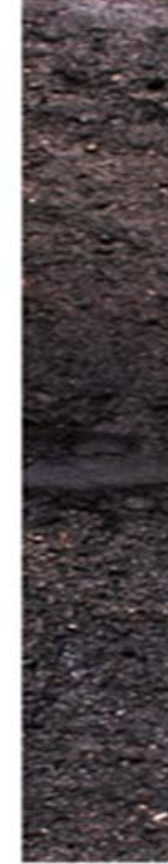
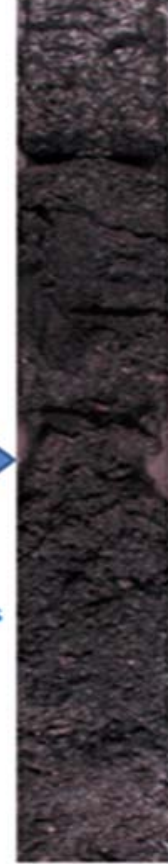


←
Eurimji
Bank
Core
Materials

→
Eurimji
Bottom
Core
Sediments

Lake Bottom Sediment Cores

310.23m 309.73m 308.73m



309.4m

308.9m

308.4m

309.73m

309.23m

308.23m

Comparison of the lower part of Eurimji artificial embankment material (core BH-1) and the natural bottom sediments of the Eurim Lake (core EL-3-1), which occur at the same altitude.

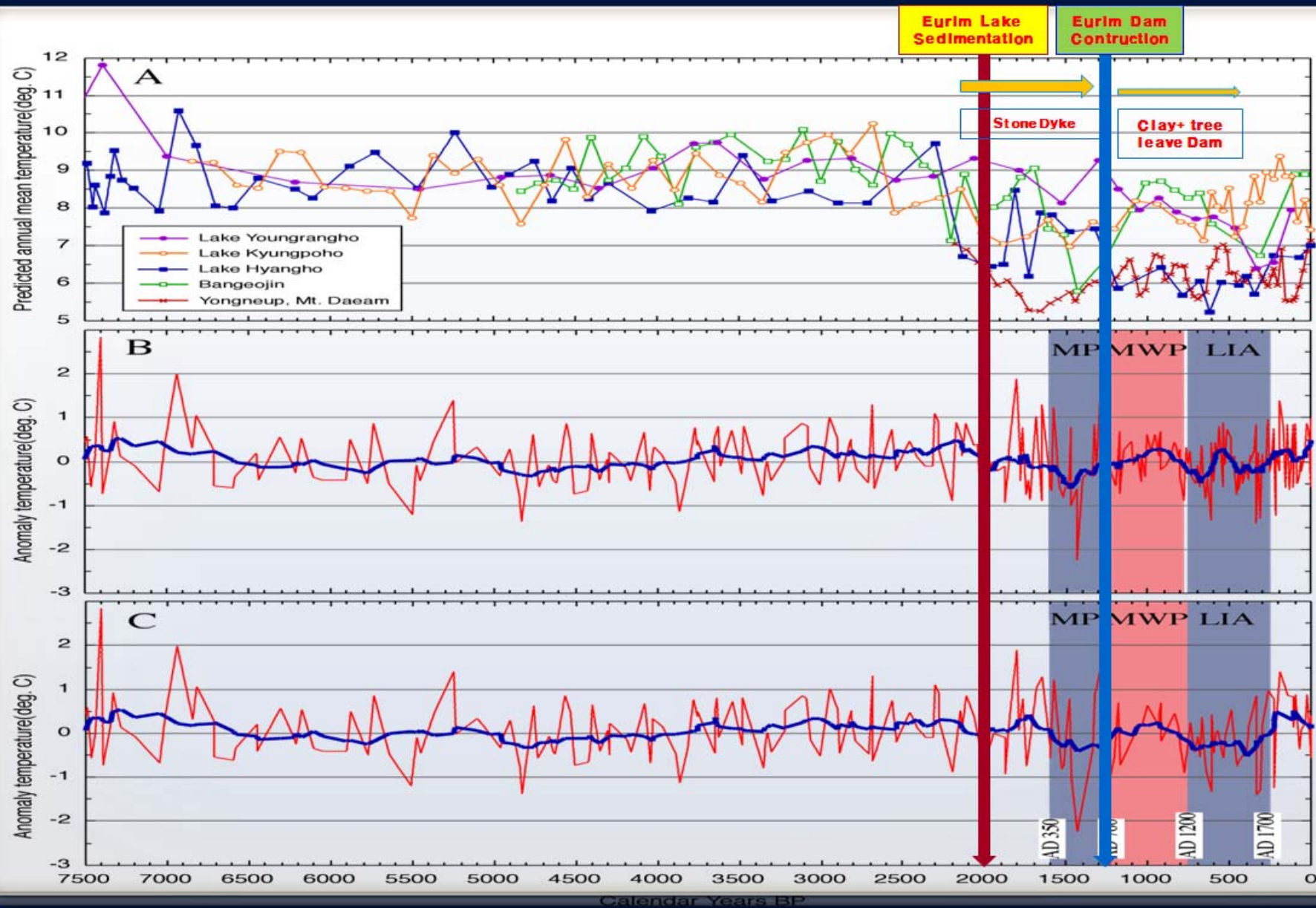
Summary : Lake Embankment

- **Older than 2700yrBP : stream and valley fills at distal fan/cone**
- **Unified Silla Dynasty~ Iron Age (late) : Dam filled with Sand and Gravel**
- **Unified Silla Dynasty : Filled with Lake materials and Pasted by specially-treated muds/sands**
- **After Yi- Dynasty : Artificially dammed by earth materials**

Summary : Lake Bottom Sediment

- **Undisturbed coarse sands as lake Sediments, older than 1900yrBP**
- **Undisturbed fine lake sediments (muds & sands), older than about 1500yrBP**
- **Disturbed lake sediments due to Bank construction at ca 1200yrBP, by using burned tampered muds.**
- **Undisturbed lake sediments (since 1100yrBP) until Recent Century**
- **Anthropogenic influence prevailed in the catchment (even in undisturbed part , sedimentation rate marks as high as ~ 4mm/yr)**

Discussion : Age and Climatic Implication of Embankment Construction in Eurimji Valley :



Reconstructed Late Holocene temperature anomaly (Park, 2011)

Conclusion :

Implication of Eurimji Bank and Lake

1. Types of Embankment : Stone-dyke and Clay-
Leaves-dam
2. Eurim lake sedimentary records : relatively strong
winter monsoon climate was prevailed in the early
Ancient Kingdom Age until 8C-AD
3. Bio-ecological evidences : “cool and dry”
synchroneous pattern between 2 ~ 8 C-AD in E.Asia.