

Soil-Geomorphic Change during Desertification

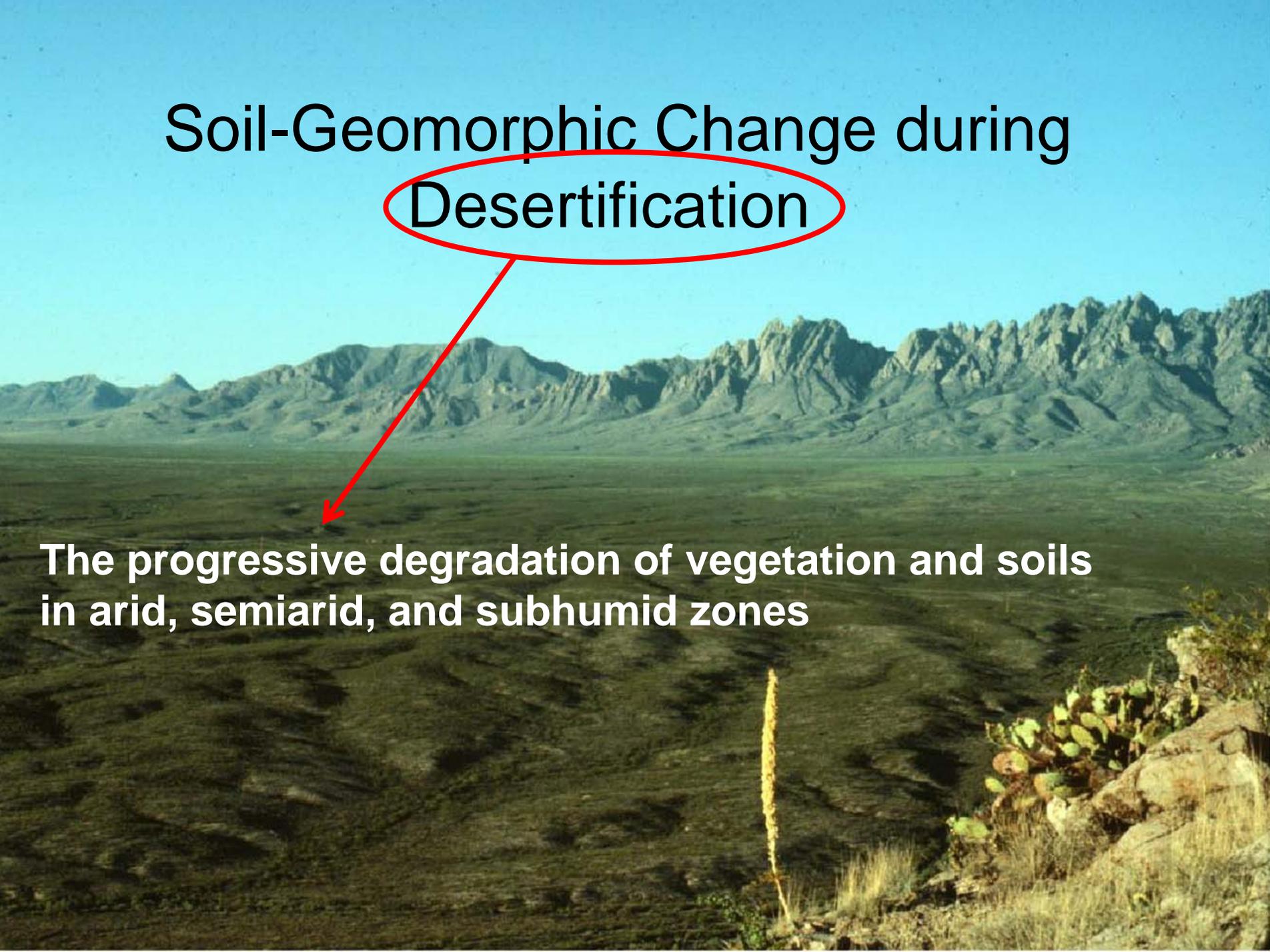
Curtis Monger
*New Mexico State University
Agronomy & Horticulture Dept.*

Brandon Bestlemeyer
*USDA-ARS
Jornada Experimental Range*

Soil-Geomorphic Change during **Desertification**



**The progressive degradation of vegetation and soils
in arid, semiarid, and subhumid zones**



Vegetation changes in the Jornada Basin from 1858 to 1998

R.P. Gibbens^a, R.P. McNeely^b, K.M. Havstad^{a,*},
R.F. Beck^b, B. Nolen^c

^aUSDA Agricultural Research Service, Jornada Experimental Range, MSC 3JER Las Cruces,
New Mexico, NM 88003-8003, USA

^bAnimal and Range Science Department, New Mexico State University, Las Cruces, New Mexico

^cBiology Department, New Mexico State University, Las Cruces, New Mexico

Received 13 October 2003; received in revised form 22 September 2004; accepted 21 October 2004
Available online 22 December 2004

Abstract

Notes made by land surveyors in 1858 were utilized to estimate cover of grasses and shrubs on the Jornada Experimental Range (JER) and the Chihuahuan Desert Range Research Center (CDRRC) in the northern Chihuahuan Desert in southern New Mexico, USA. Portions of these areas have been previously assessed for historical vegetation dynamics but the entire 84,271 ha assessed in the 19th century has not been examined in total. In 1858, fair to very good grass cover occurred on 98% and 67% of the JER and CDRRC, respectively. Shrubs were present throughout both properties but 45% of the JER and 18% of the CDRRC were shrub free. Reconnaissance surveys, made to determine carrying capacity for livestock were made in 1915–1916 and 1928–1929 on the JER and in 1938 on the CDRRC, show that shrubs had made large increases in area occupied at the time of the surveys. Vegetation type maps were made of both properties in 1998. Mesquite (*Prosopis glandulosa*) was the primary dominant on 59% of the JER in 1998 and creosotebush (*Larrea tridentata*) was the primary dominant on 27% of the area. On the CDRRC mesquite and creosotebush were primary dominants on 37% and 46% of the area, respectively. Grass cover has decreased greatly with the increase in shrubs and only shrub control efforts have maintained the once abundant black

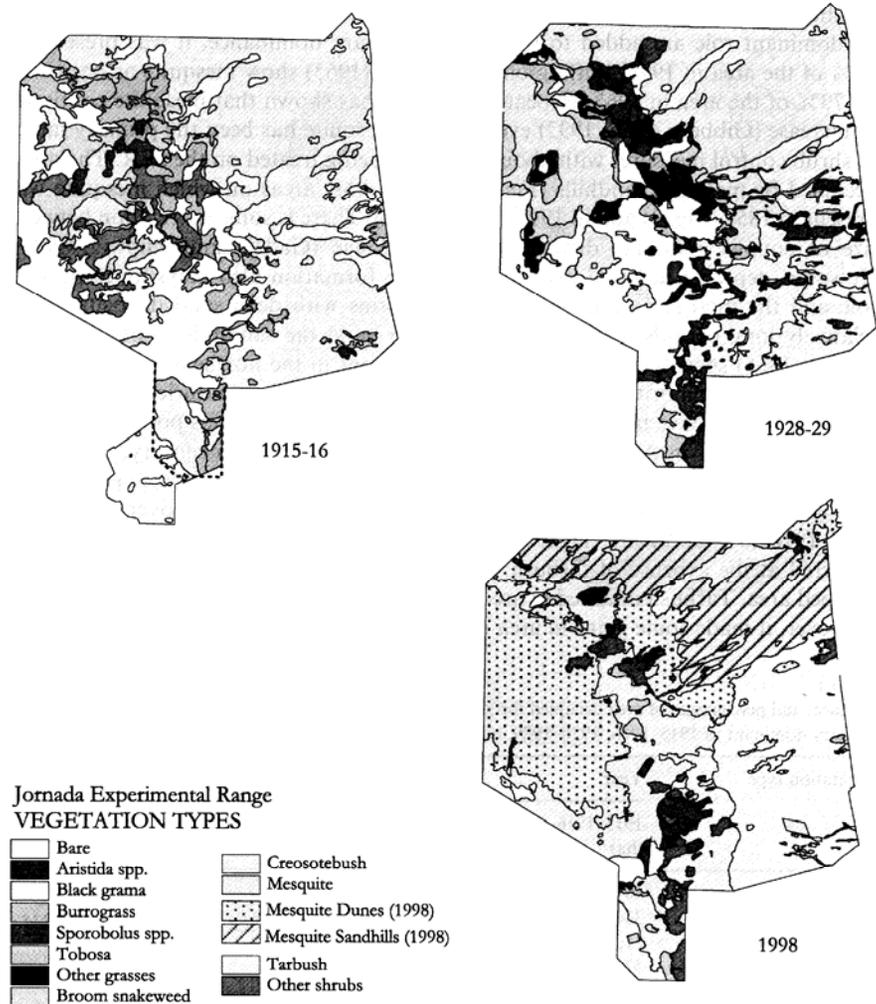


Fig. 4. Vegetation types on the Jornada Experimental Range where the listed species were the primary dominants in 1915–1916, 1928–1929, and 1998. A larger area was fenced at the southern end of the range in 1915–1916 but the area outside the dotted lines was not included in calculation of area.



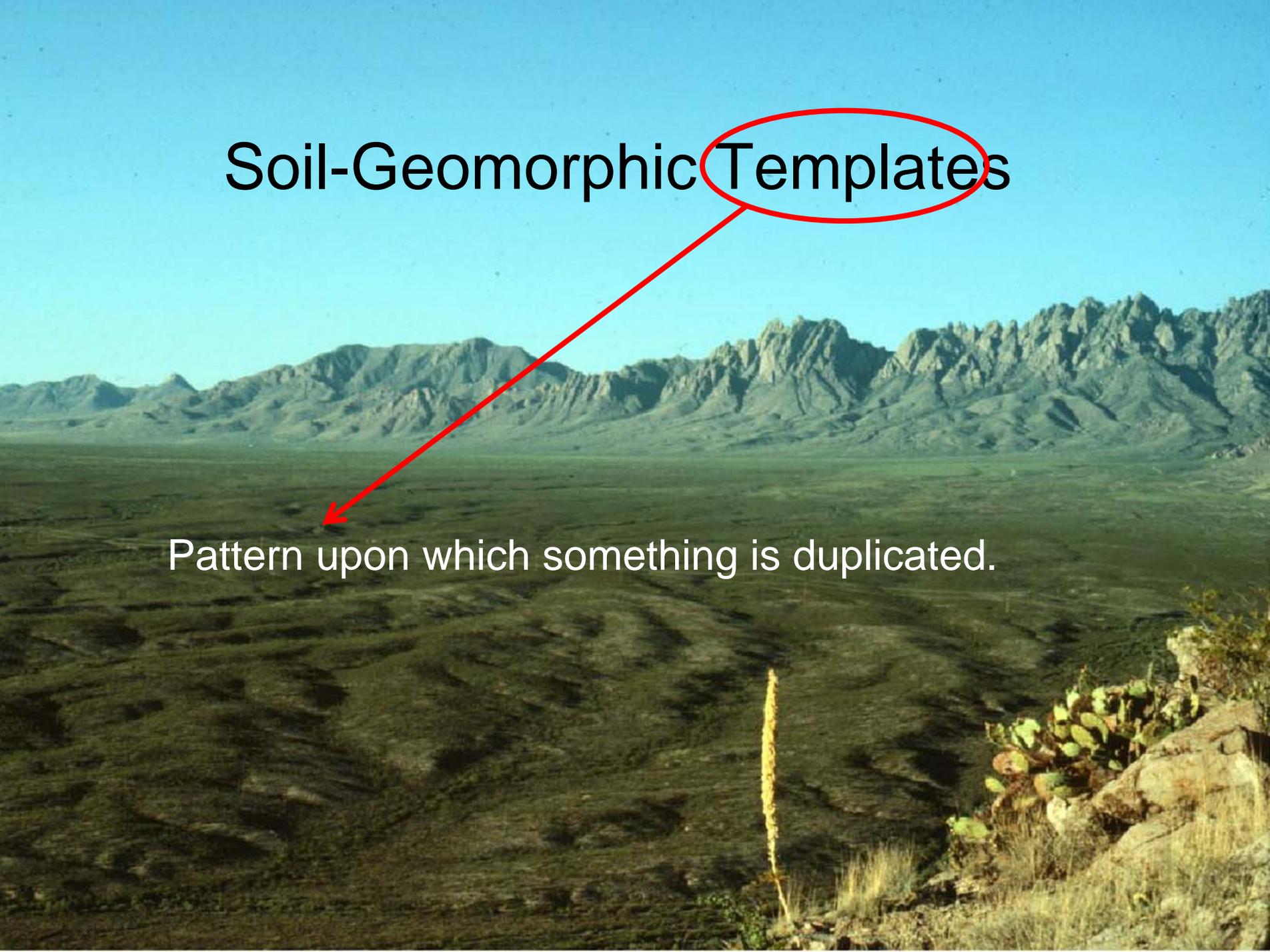


Soil-Geomorphic Templates

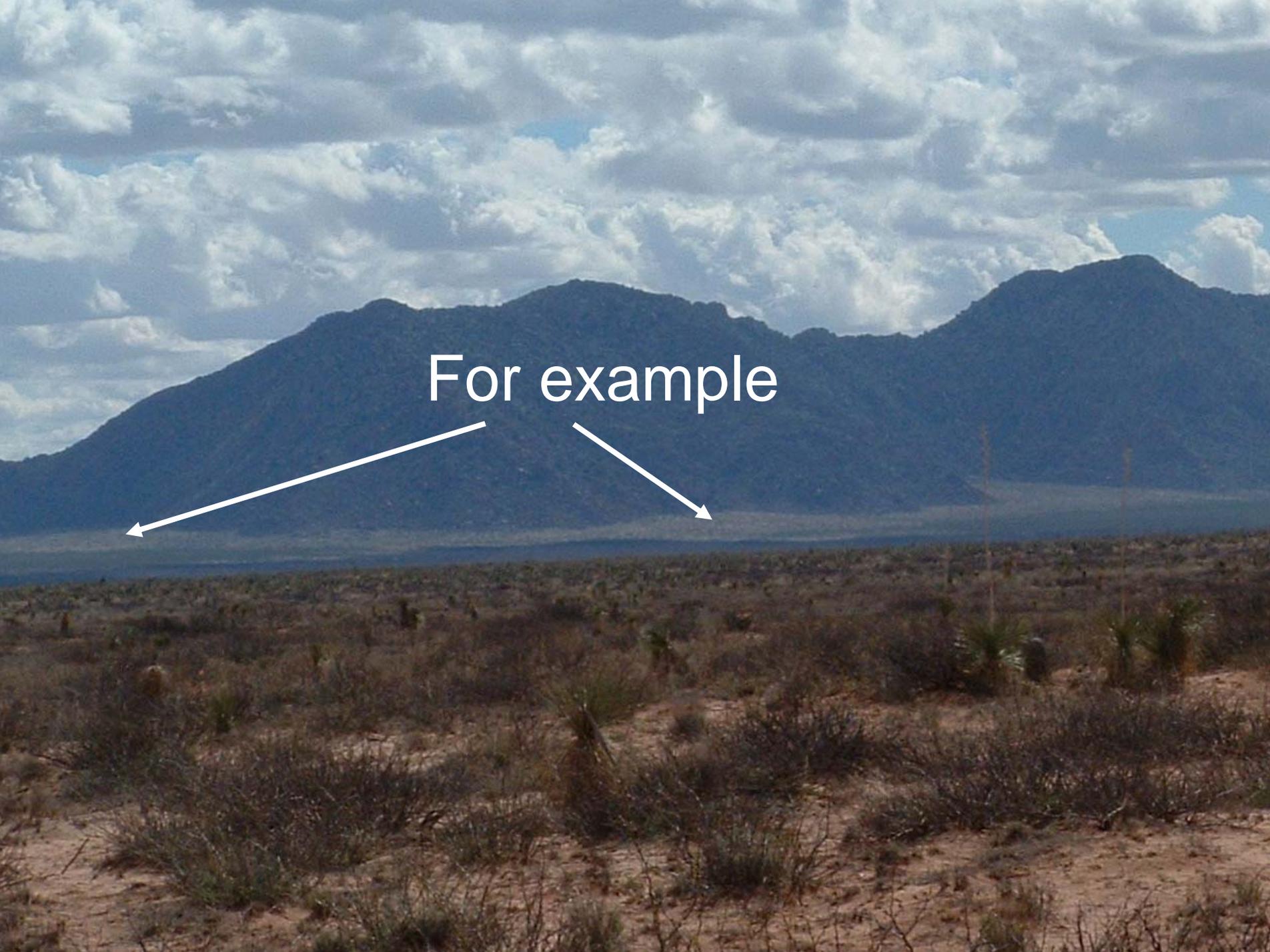


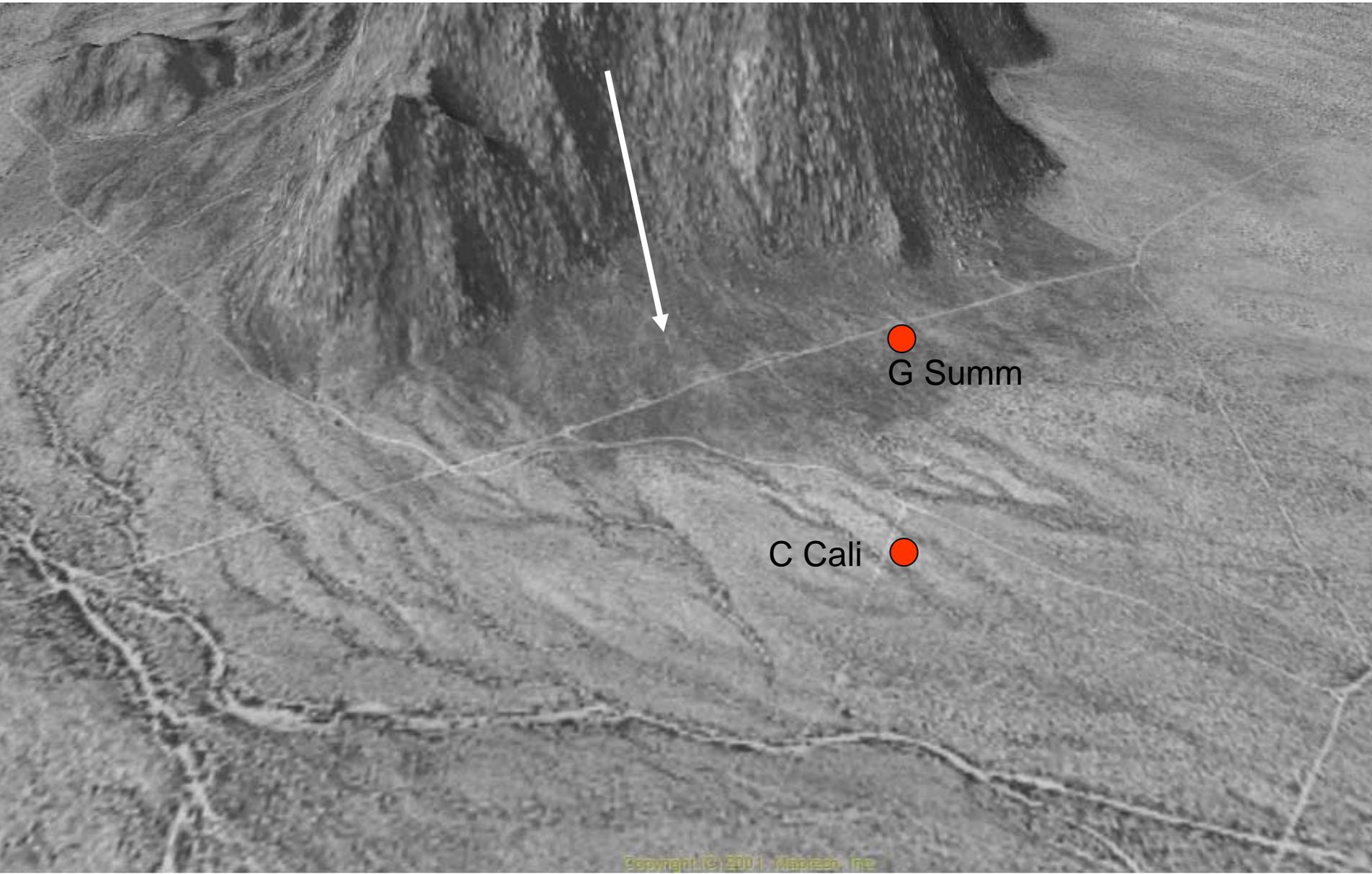
Soil-Geomorphic Templates

Pattern upon which something is duplicated.



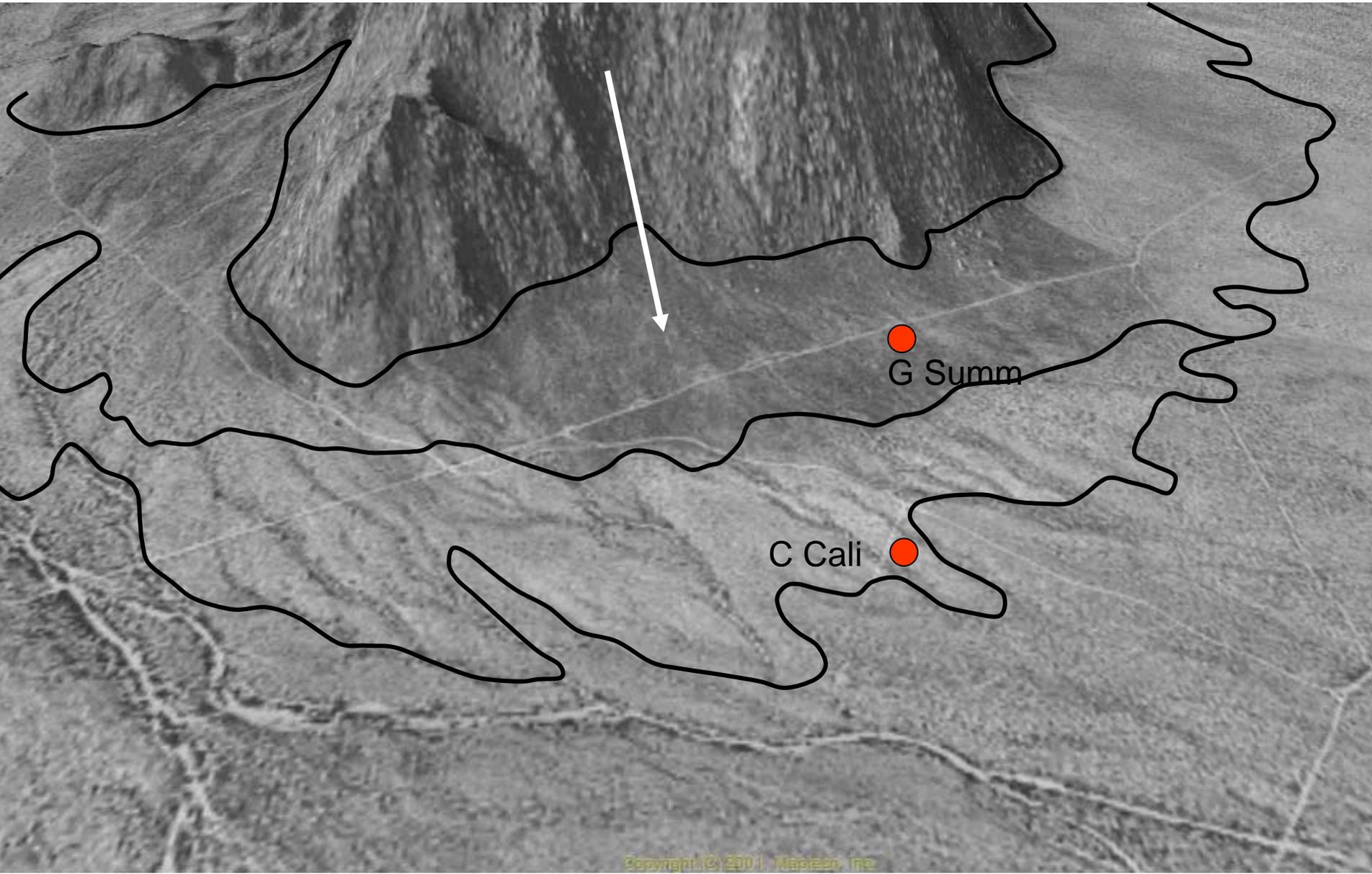
For example





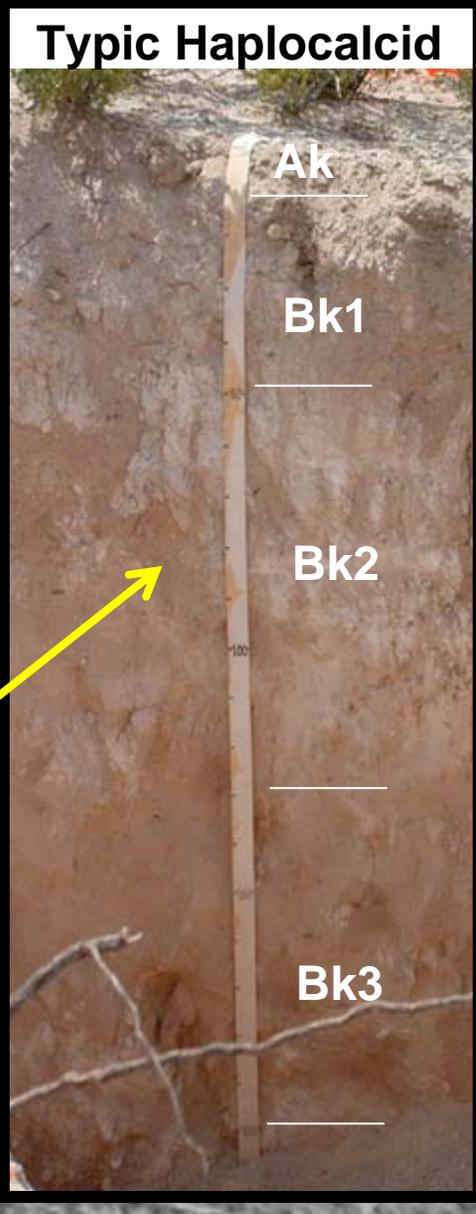
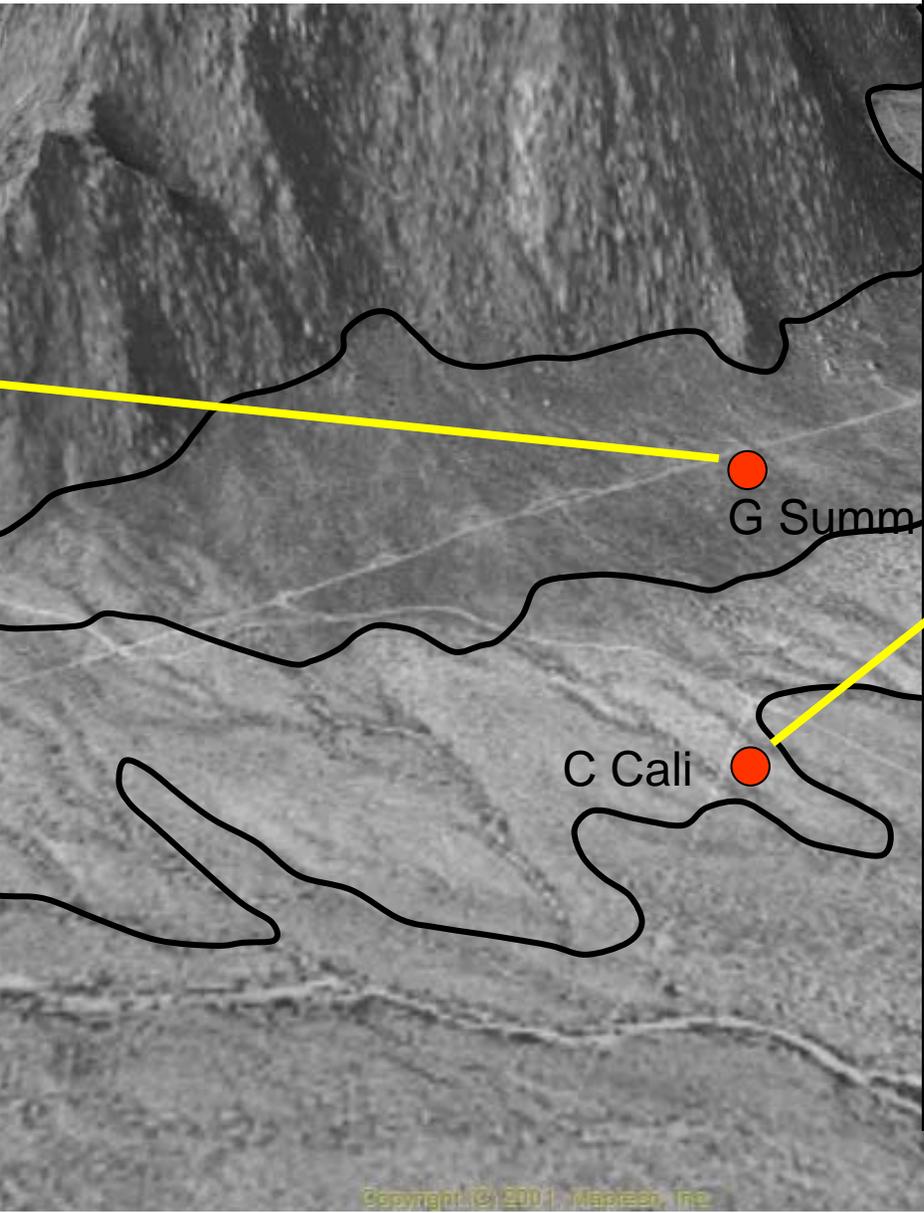
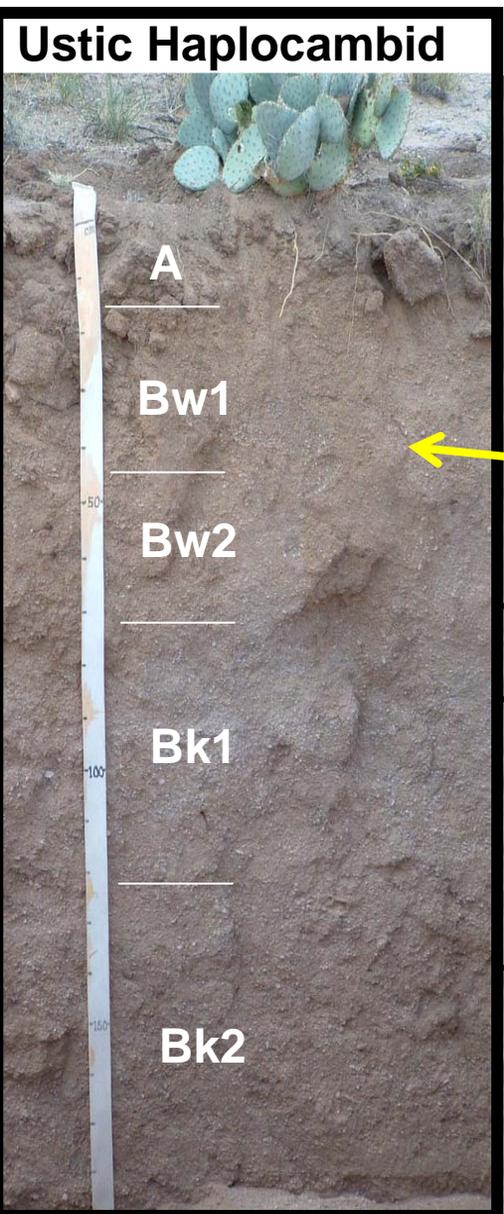
G Summ

C Cali



G Summ

C Cali



Another example

P Coll

G Basn

NRC Trench

G Summ

C Cali

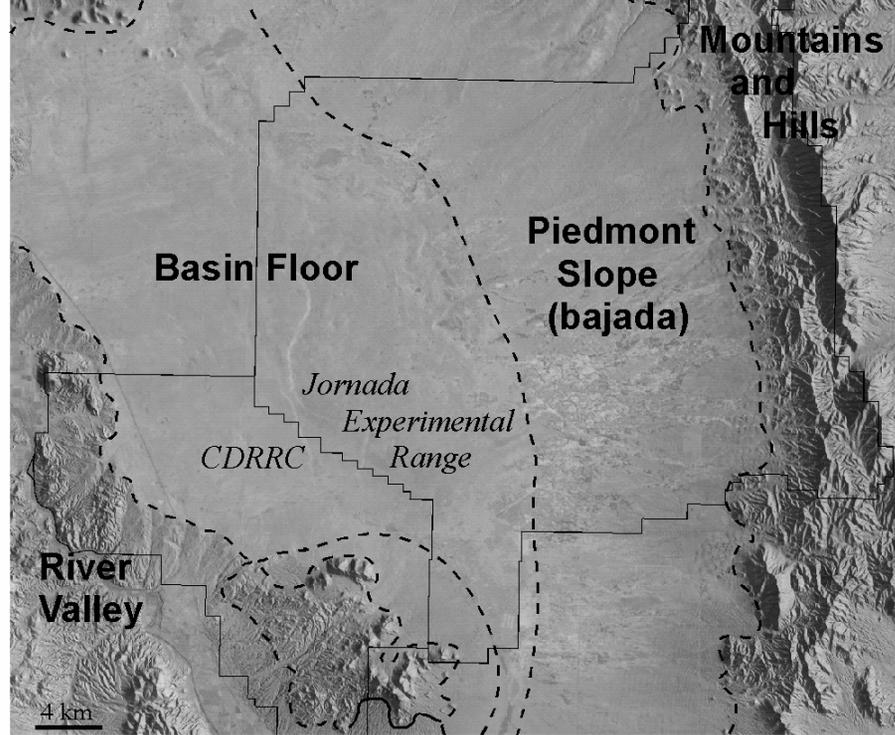
C Sand

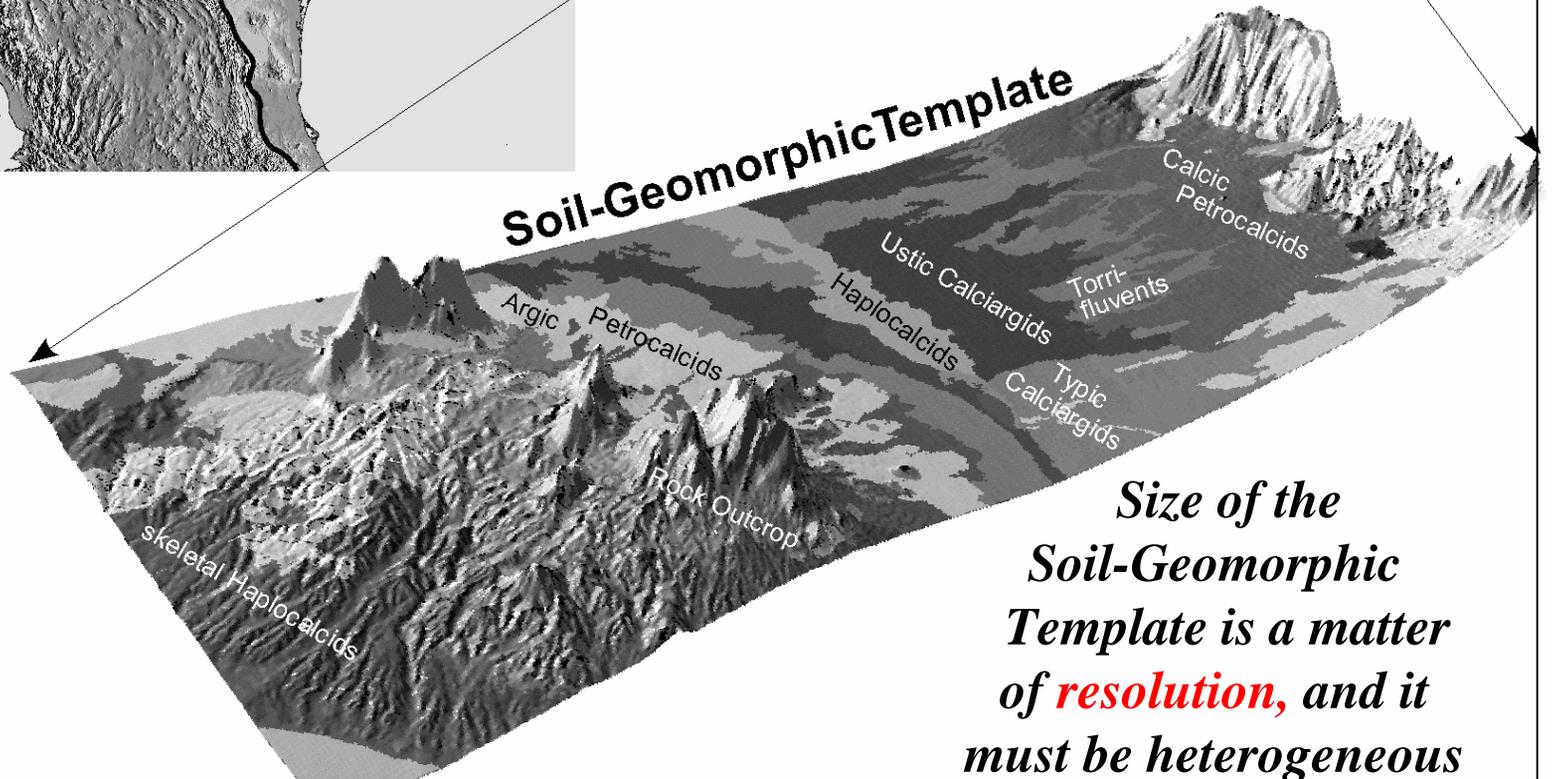
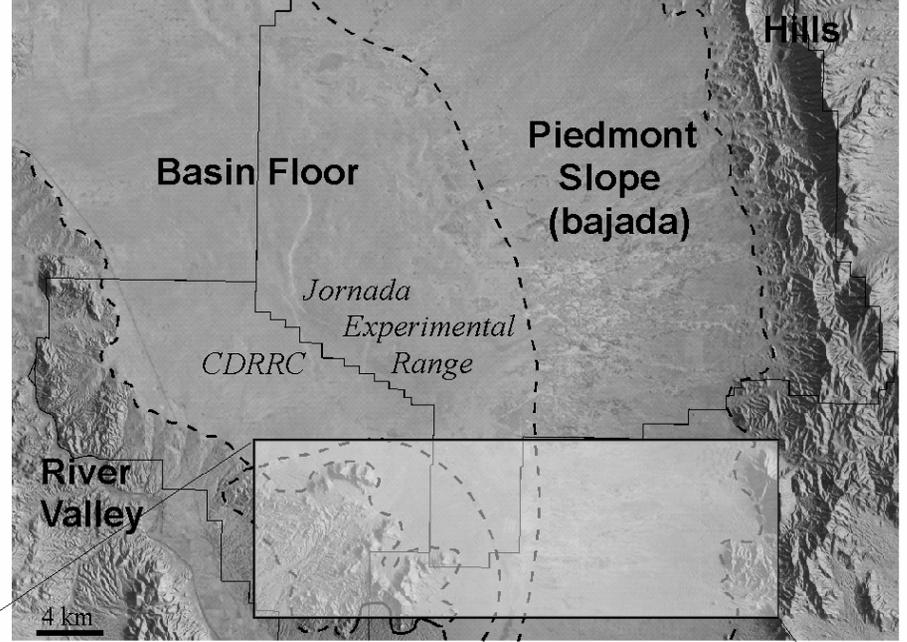
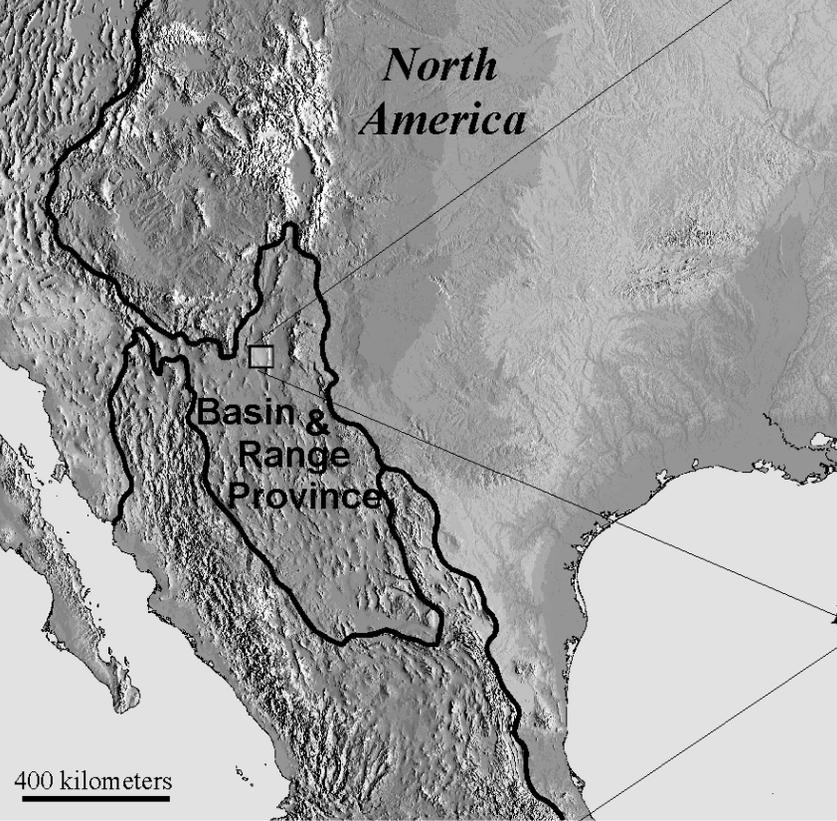




**How large is a
Soil-Geomorphic
Template?**





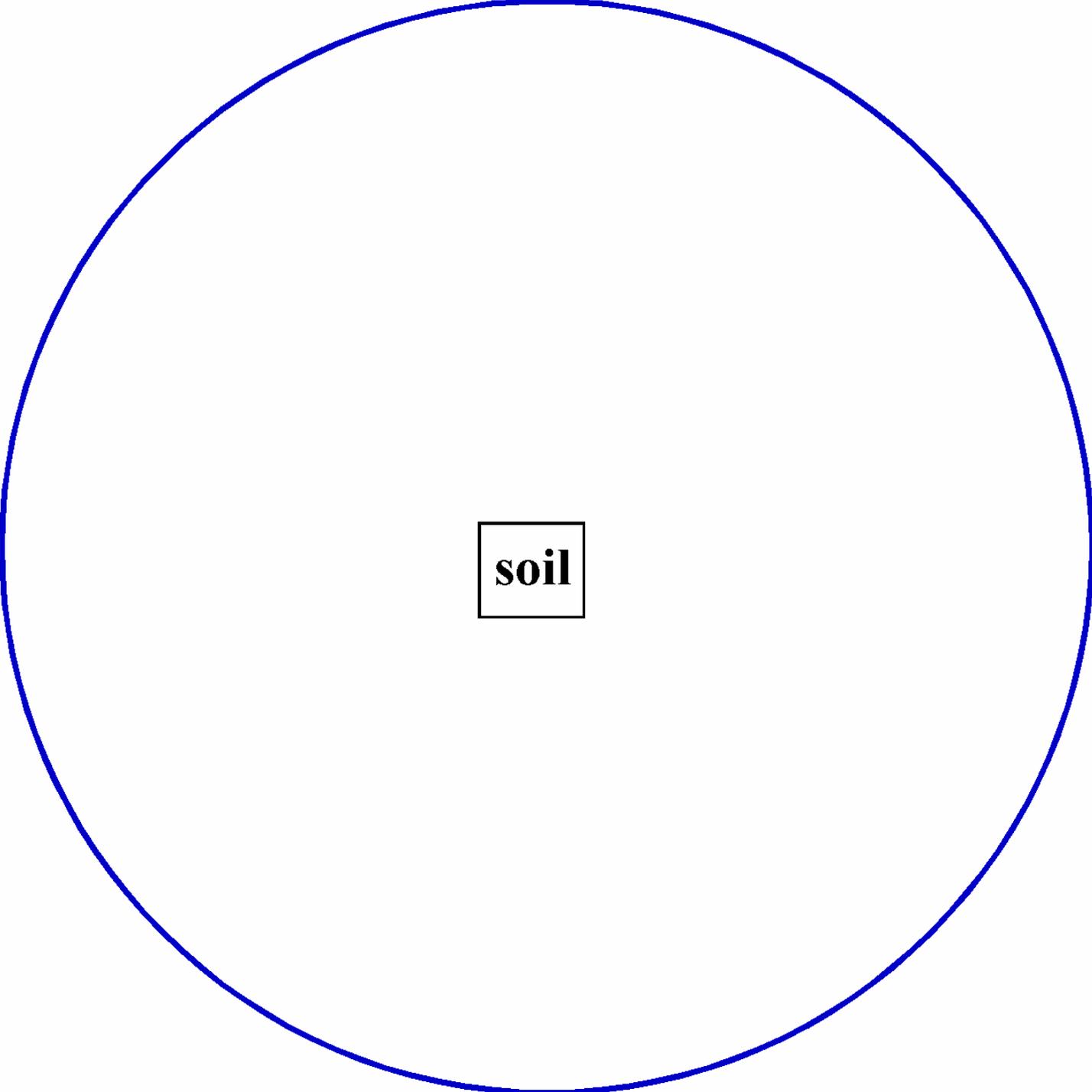


**Soil-geomorphic
change**

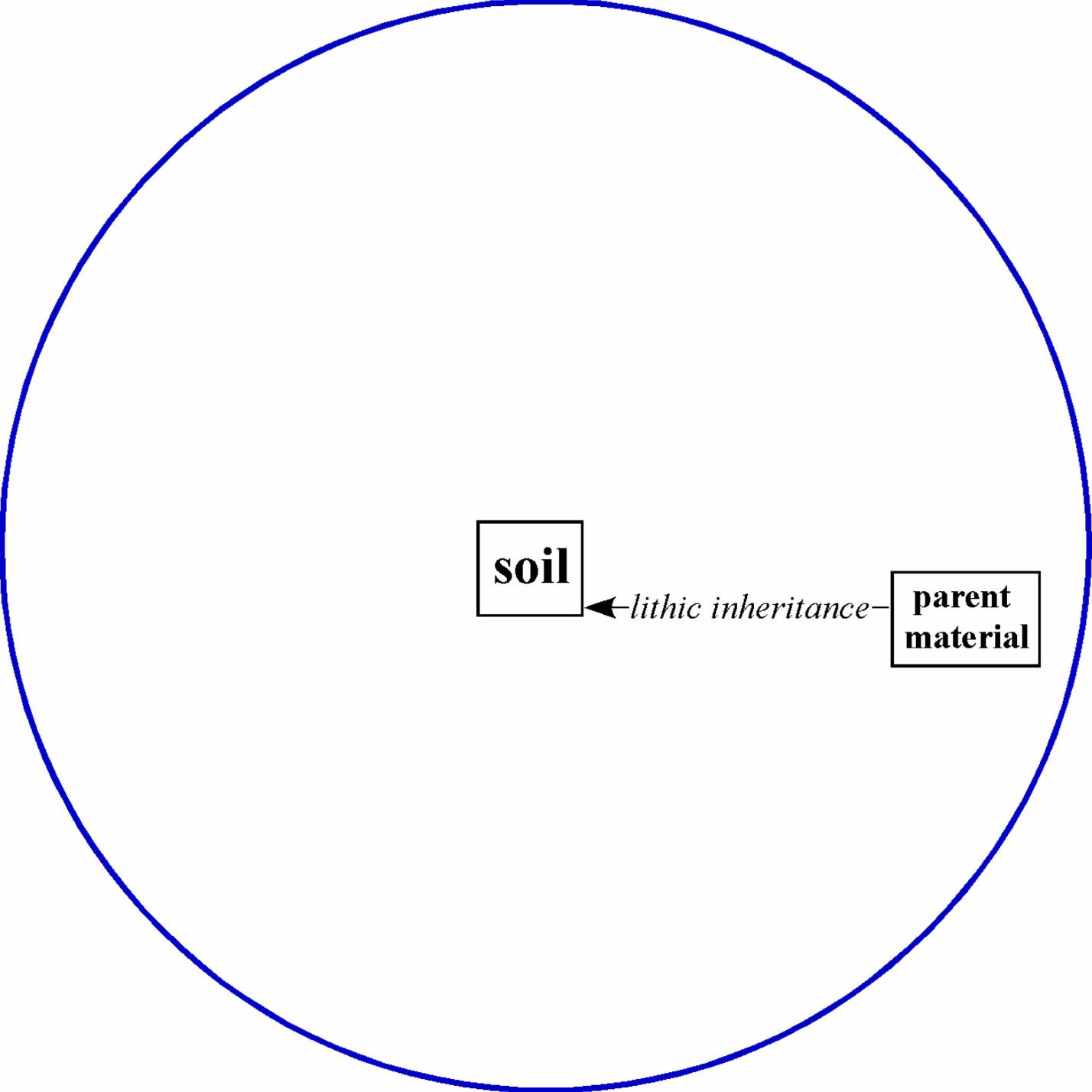


Desertification

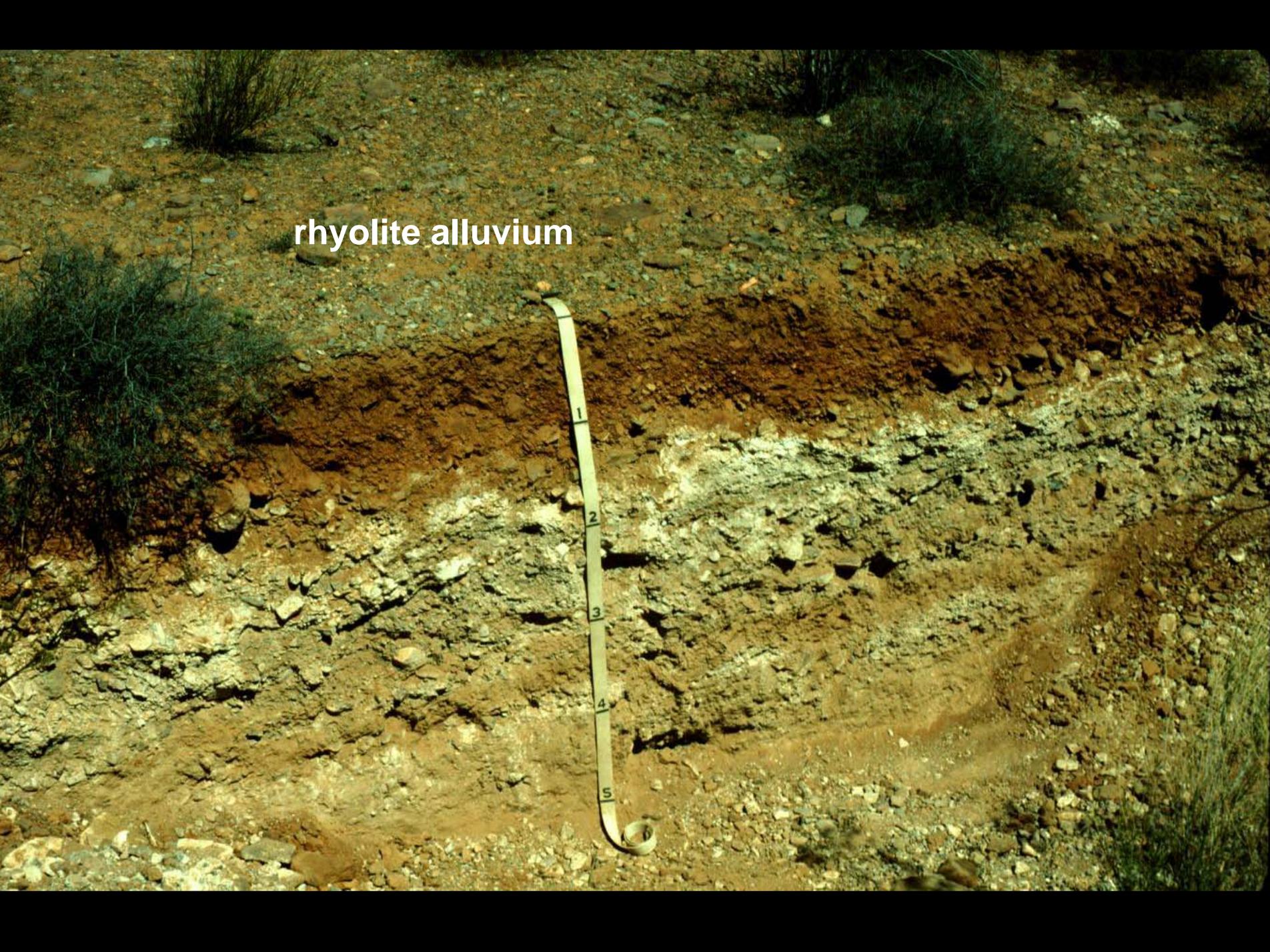




soil

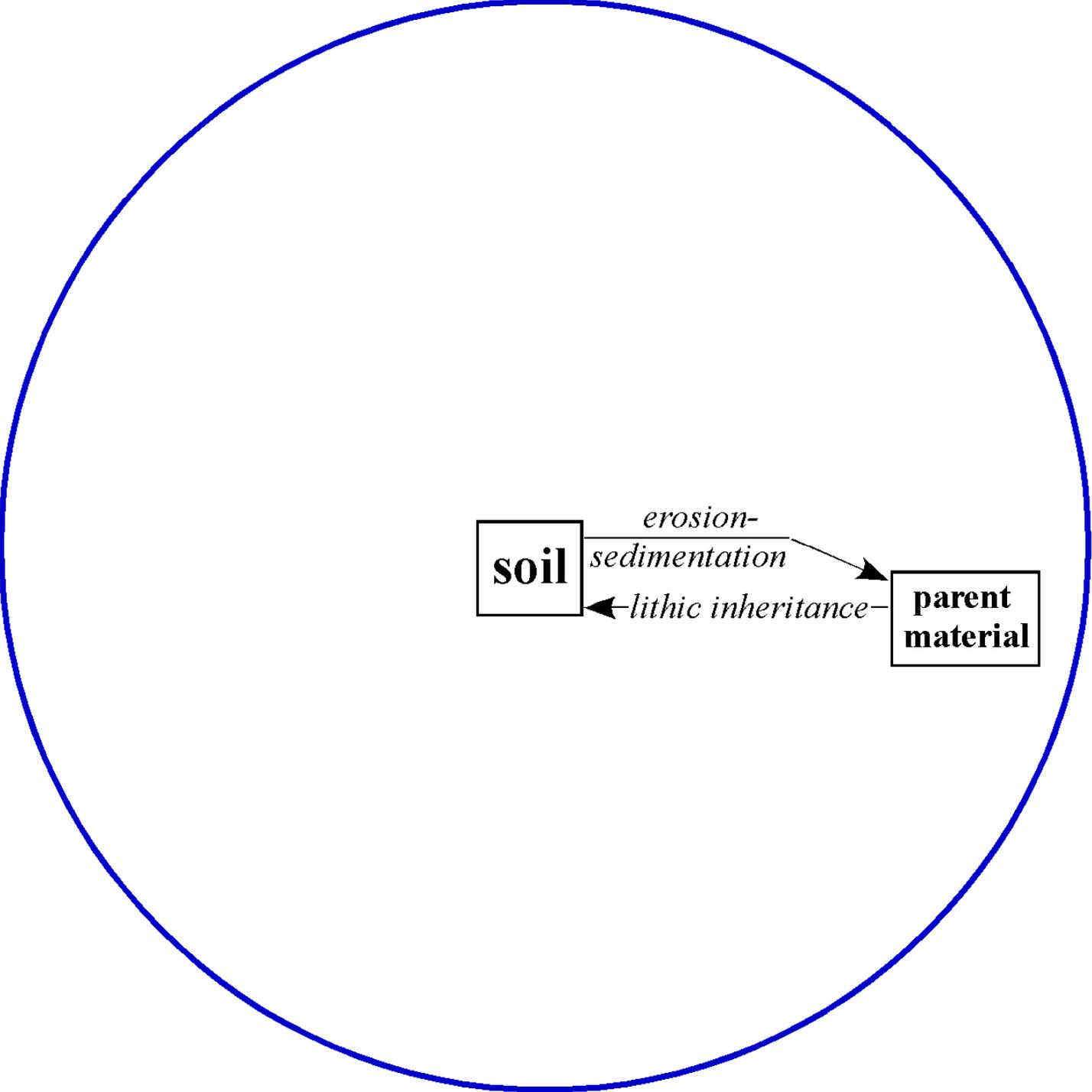


rhyolite alluvium



gypsiferous clay

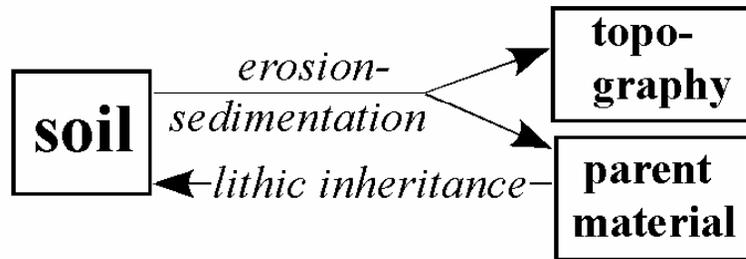








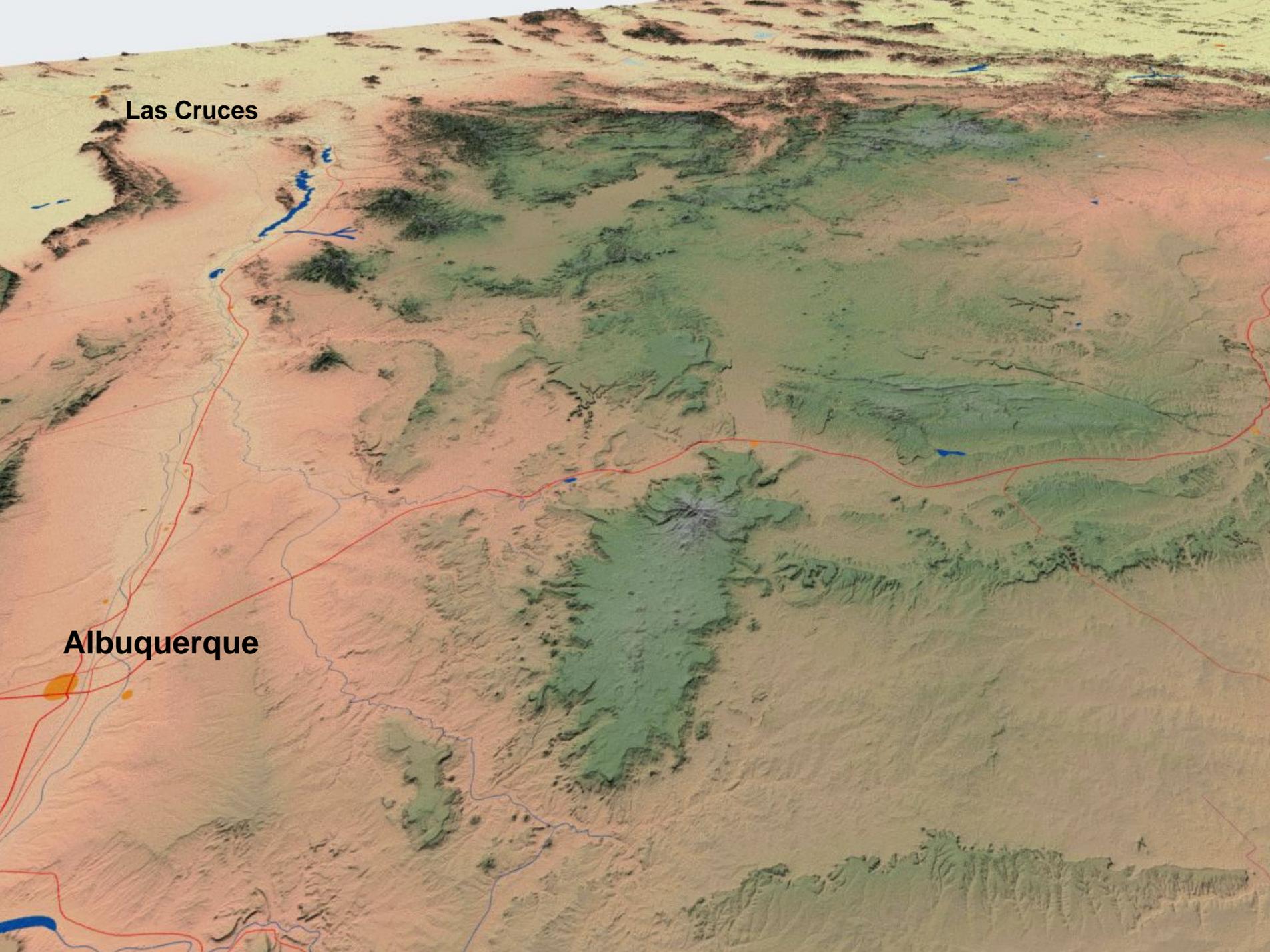
soil-geomorphic
template

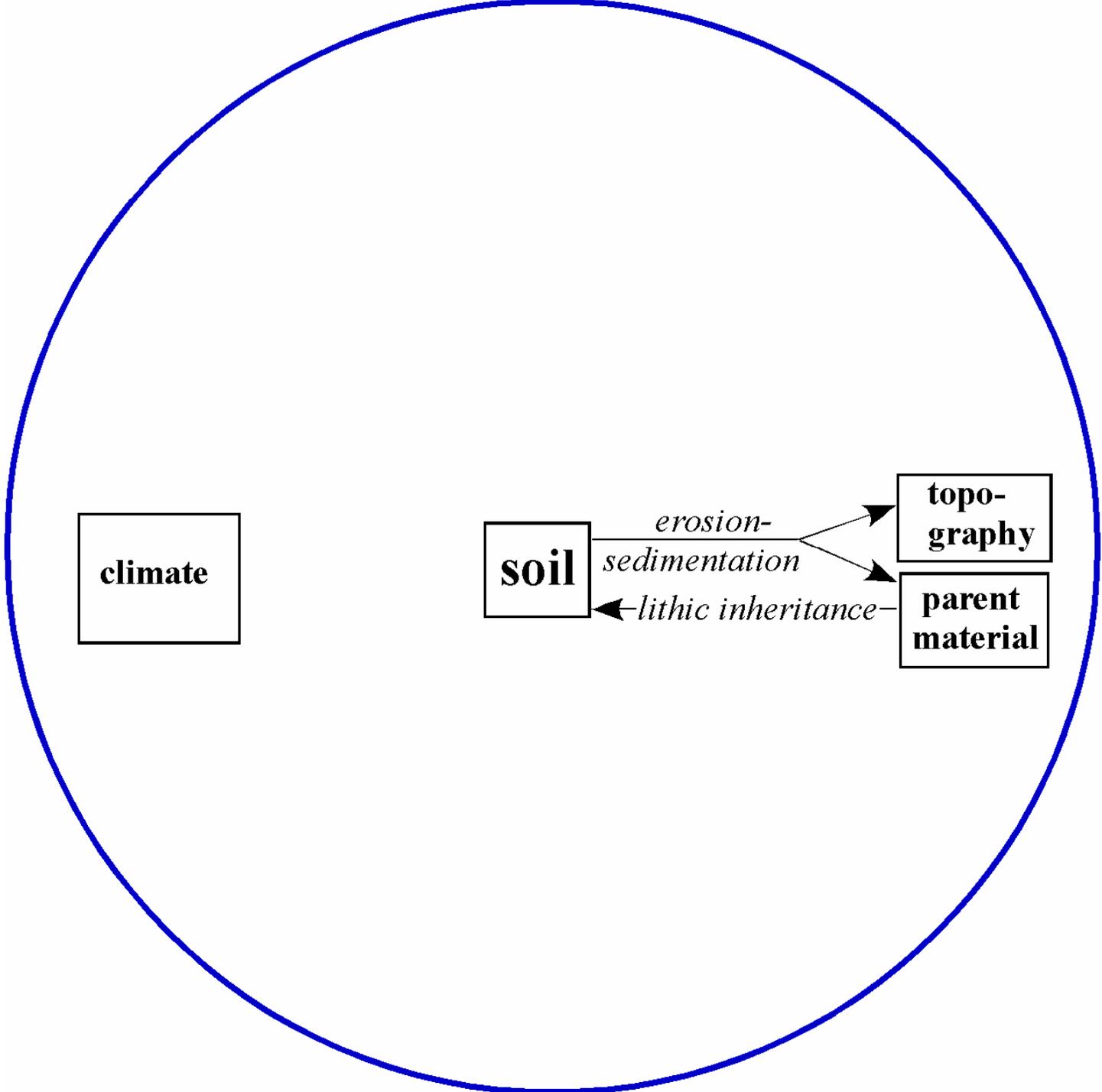


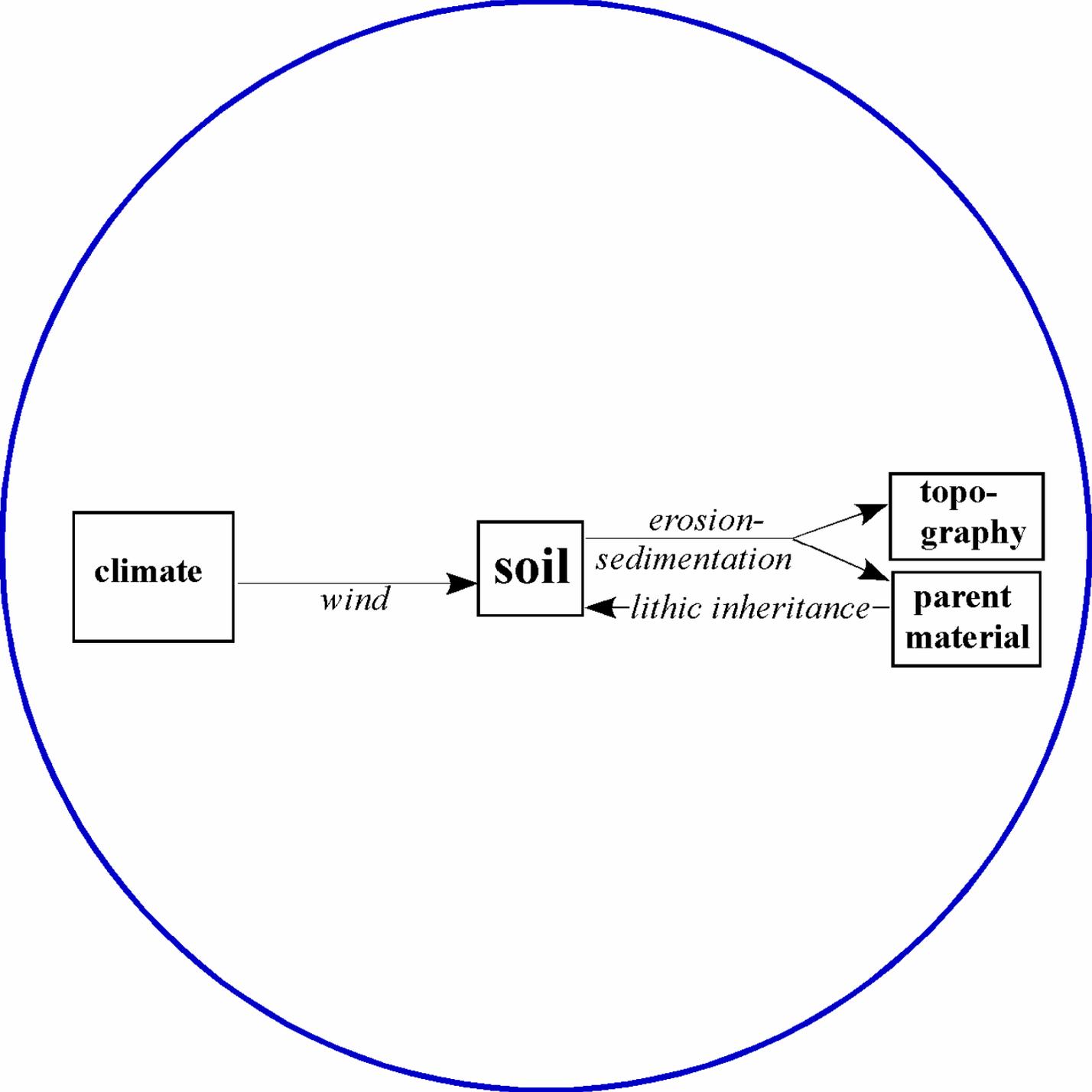


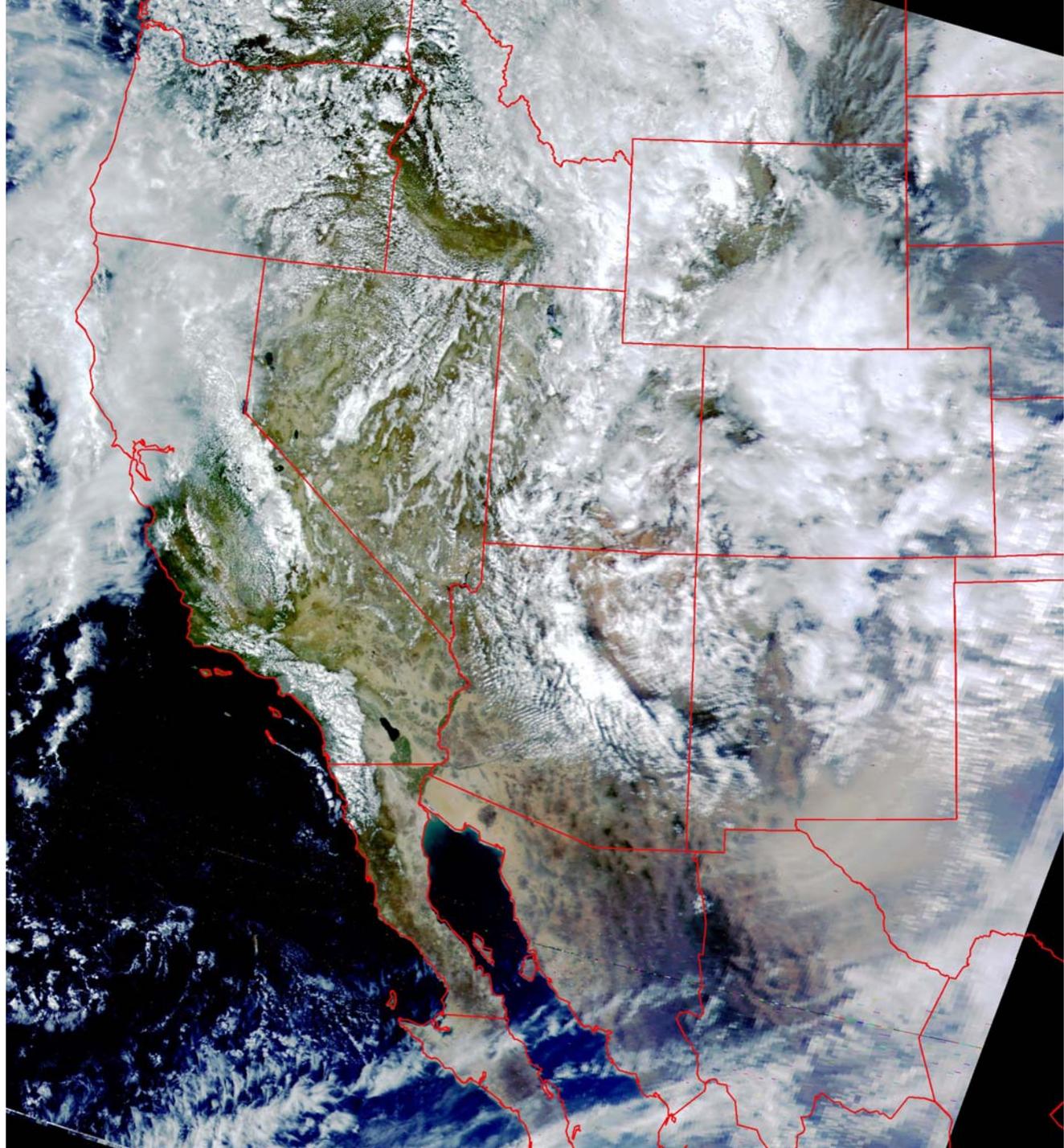
Las Cruces

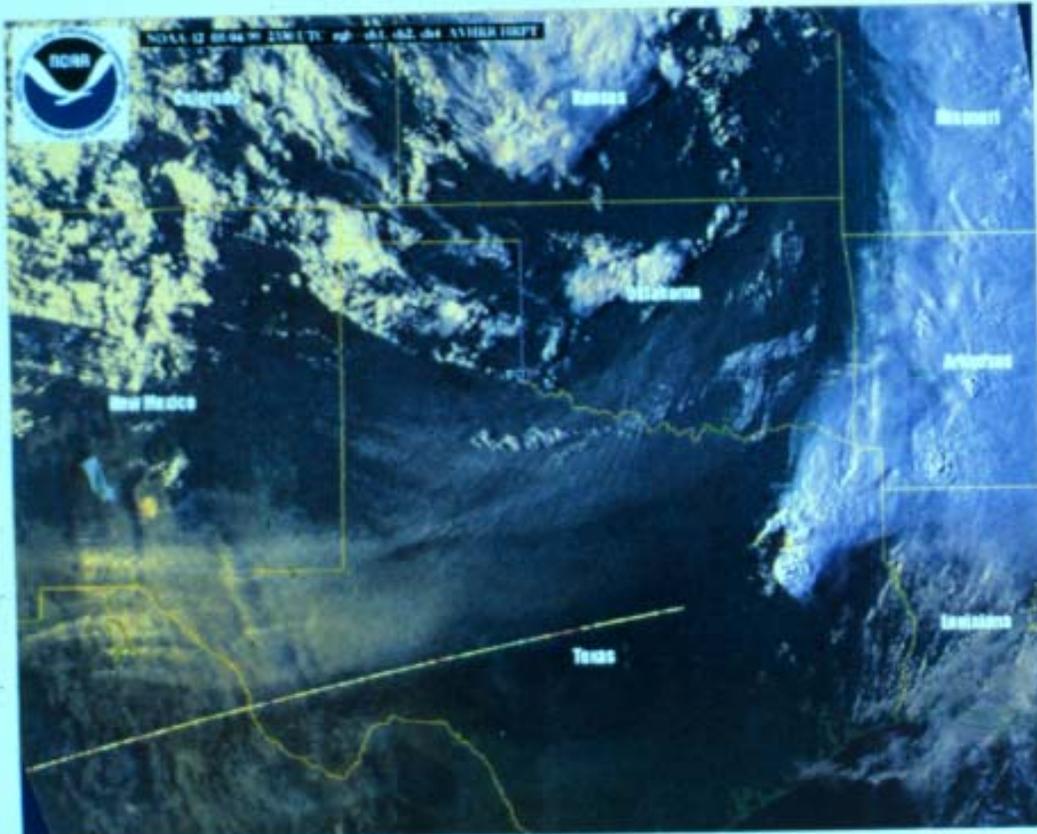
Albuquerque

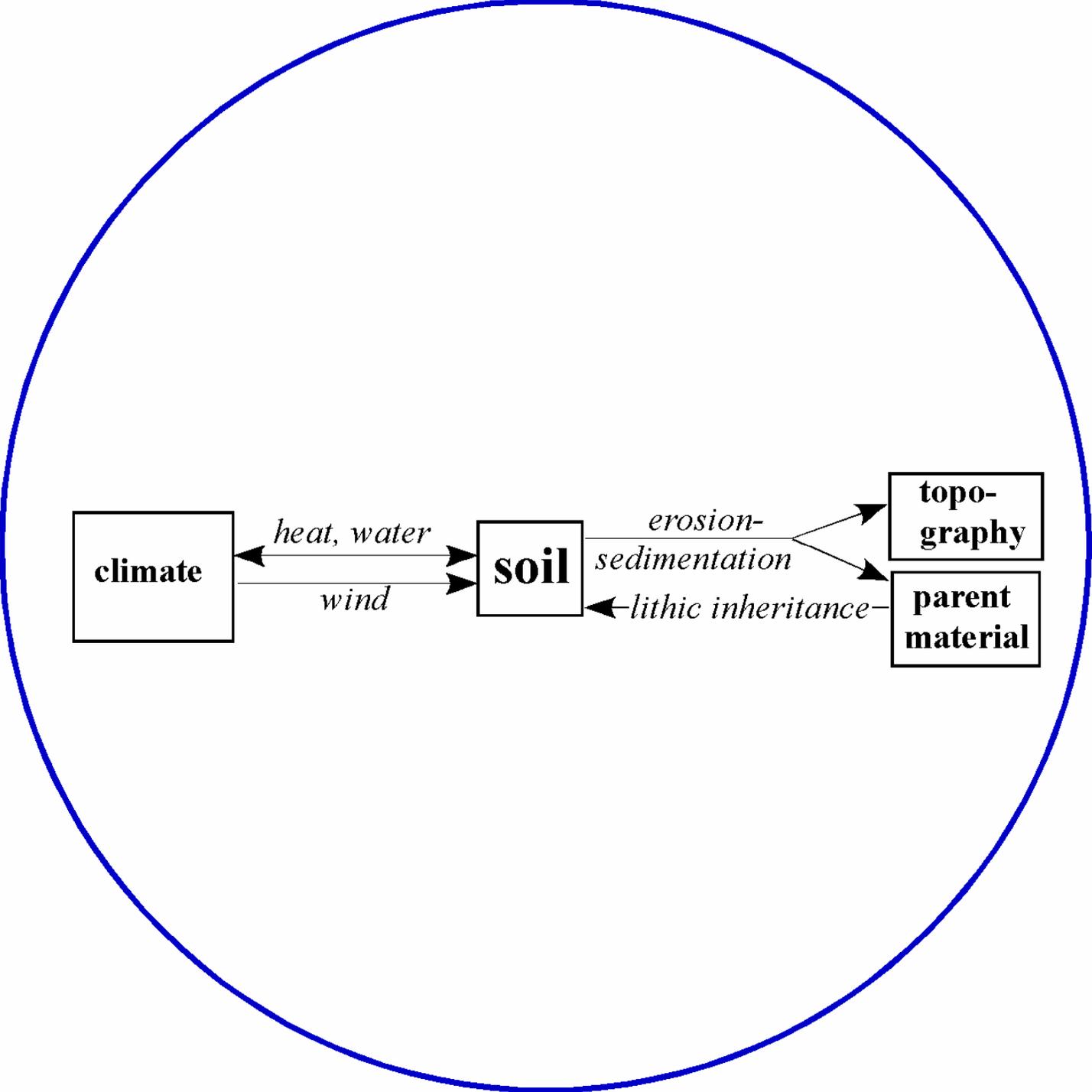


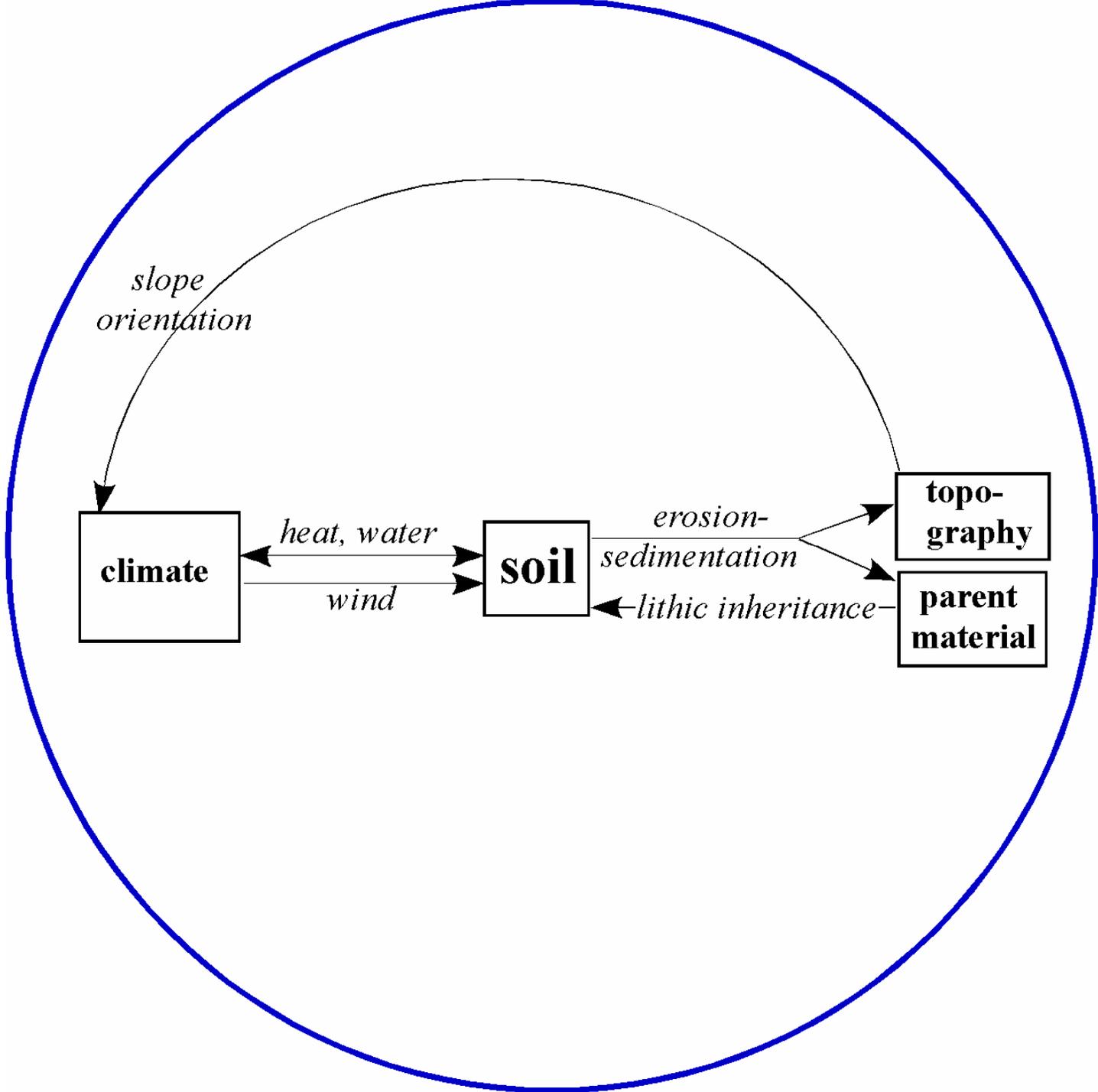




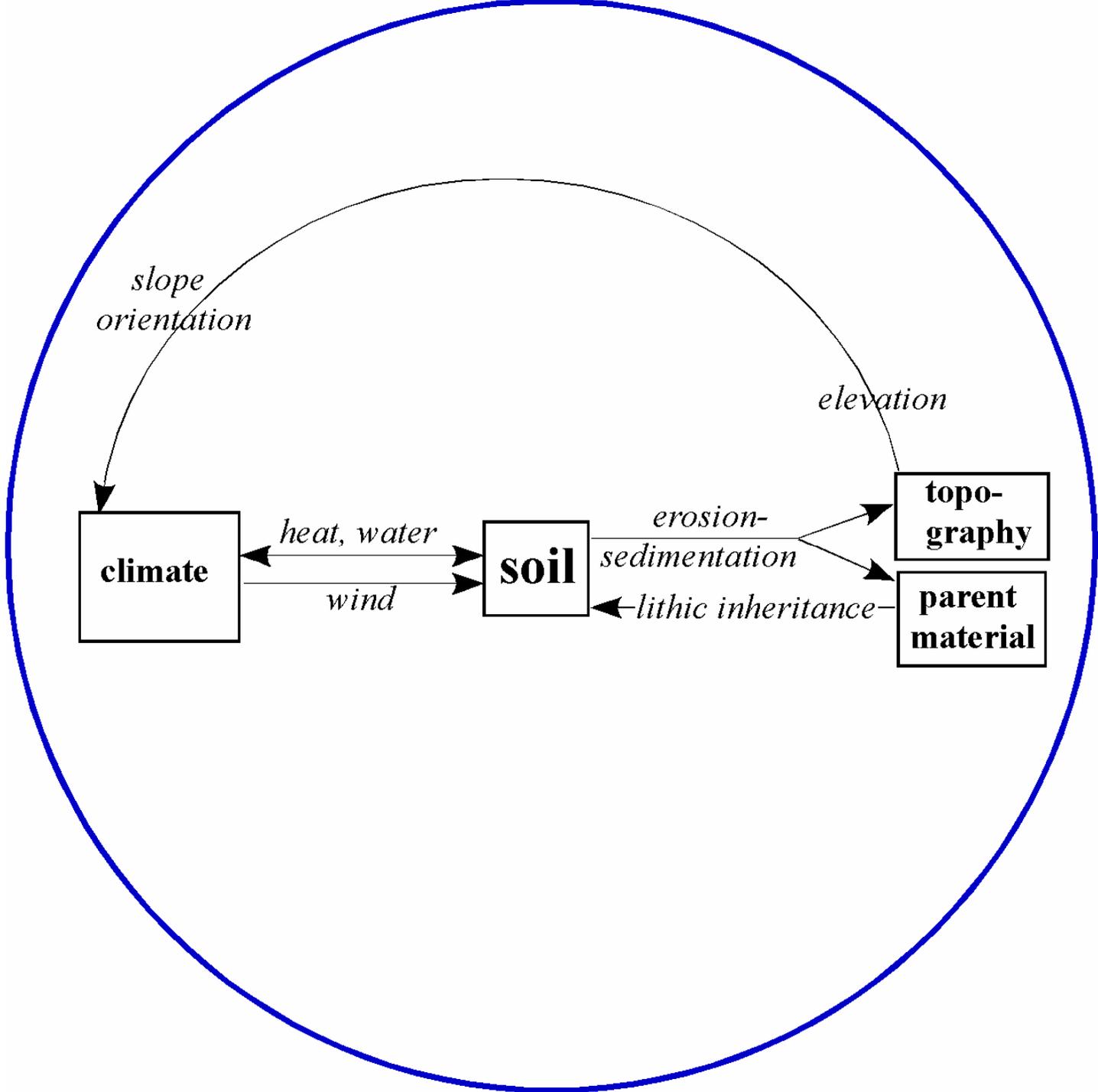


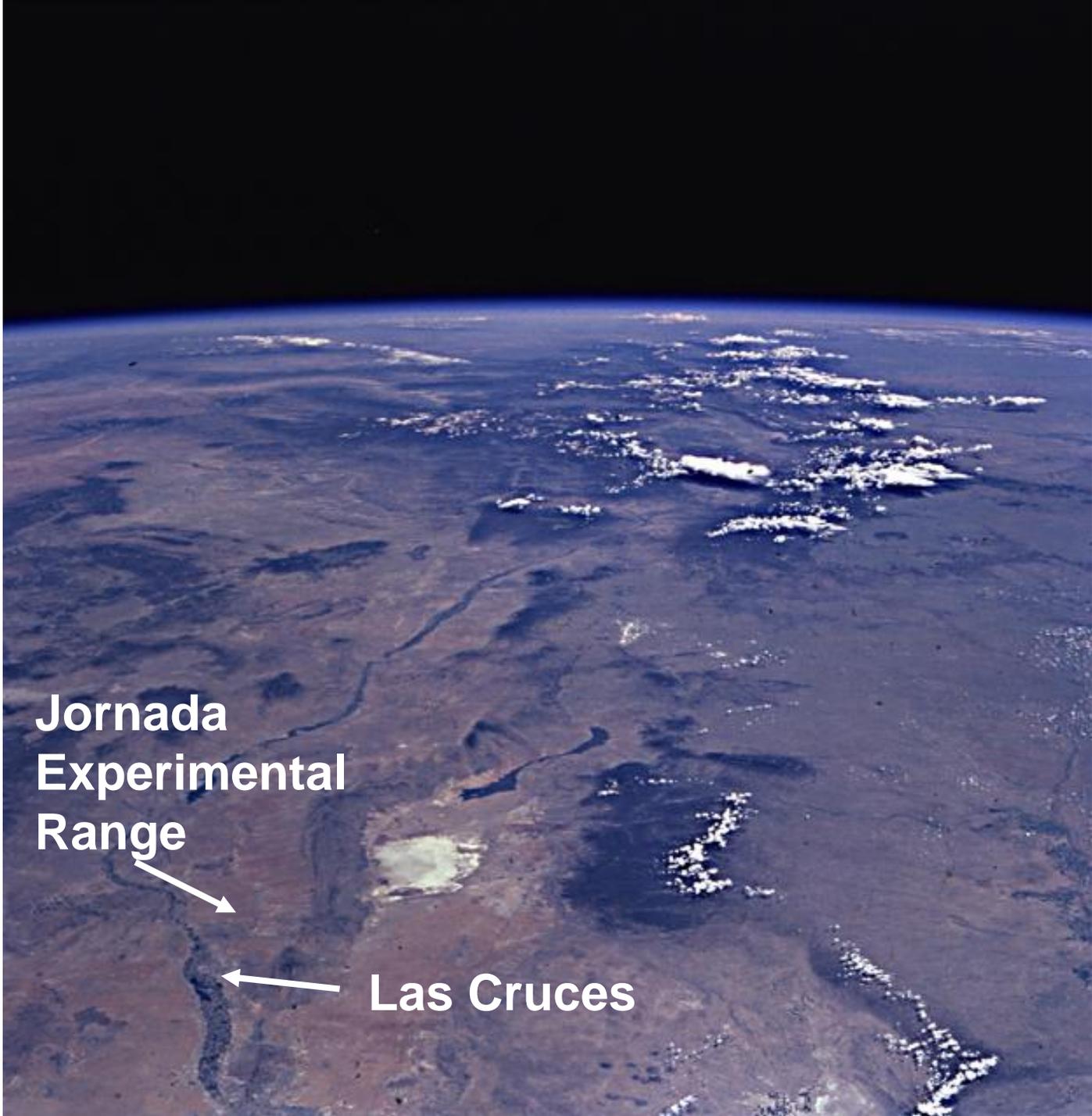












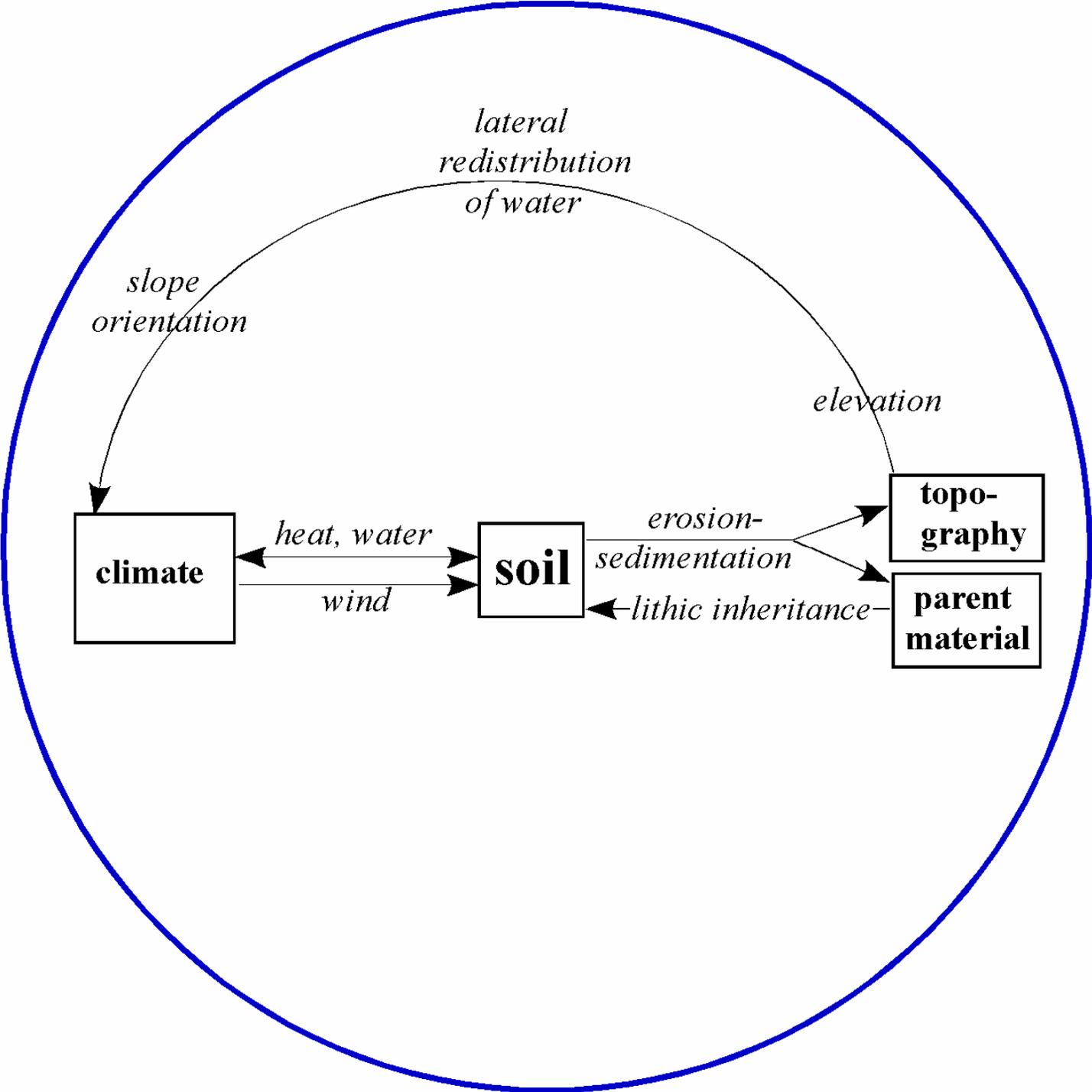
**Jornada
Experimental
Range**

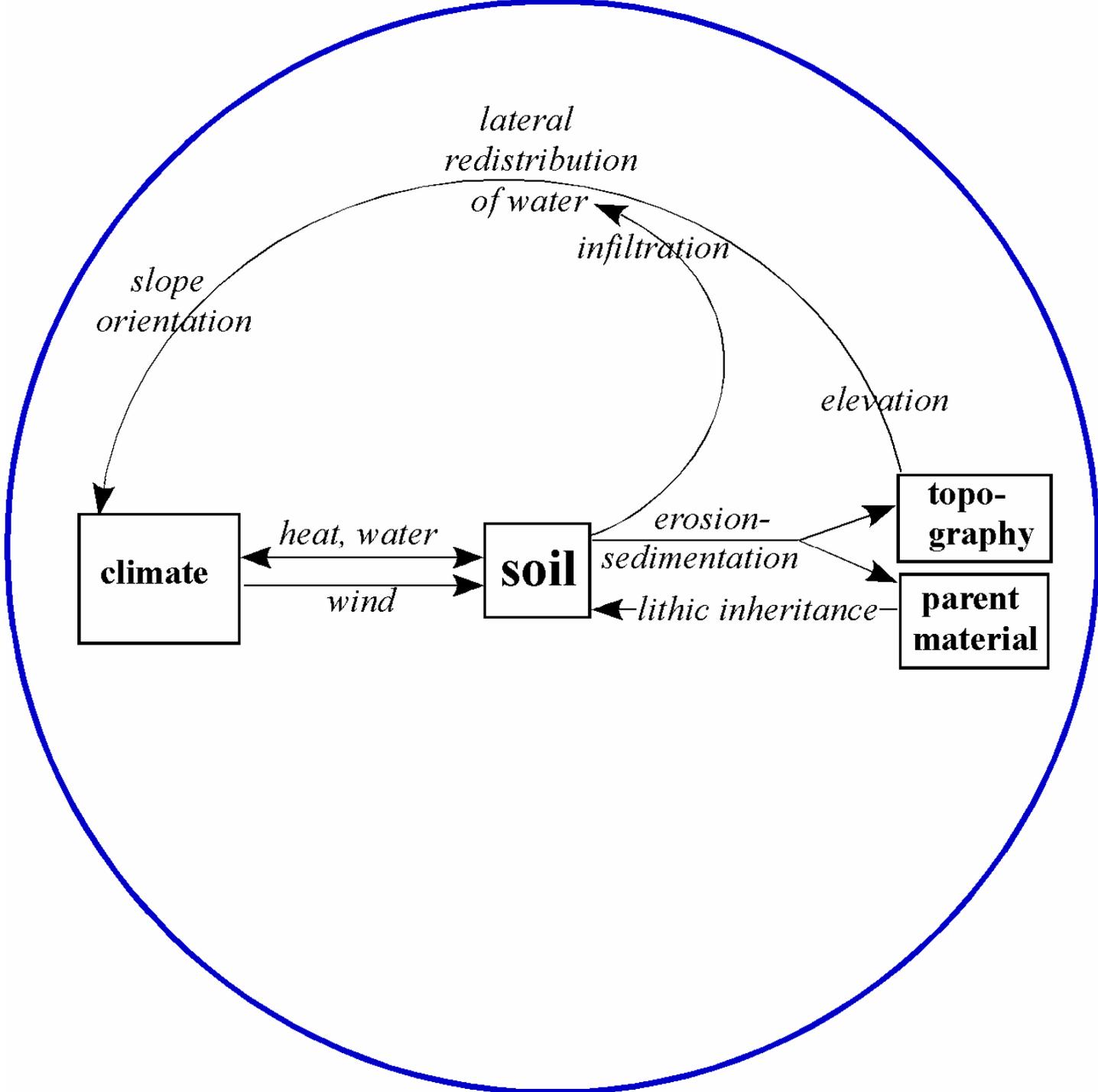


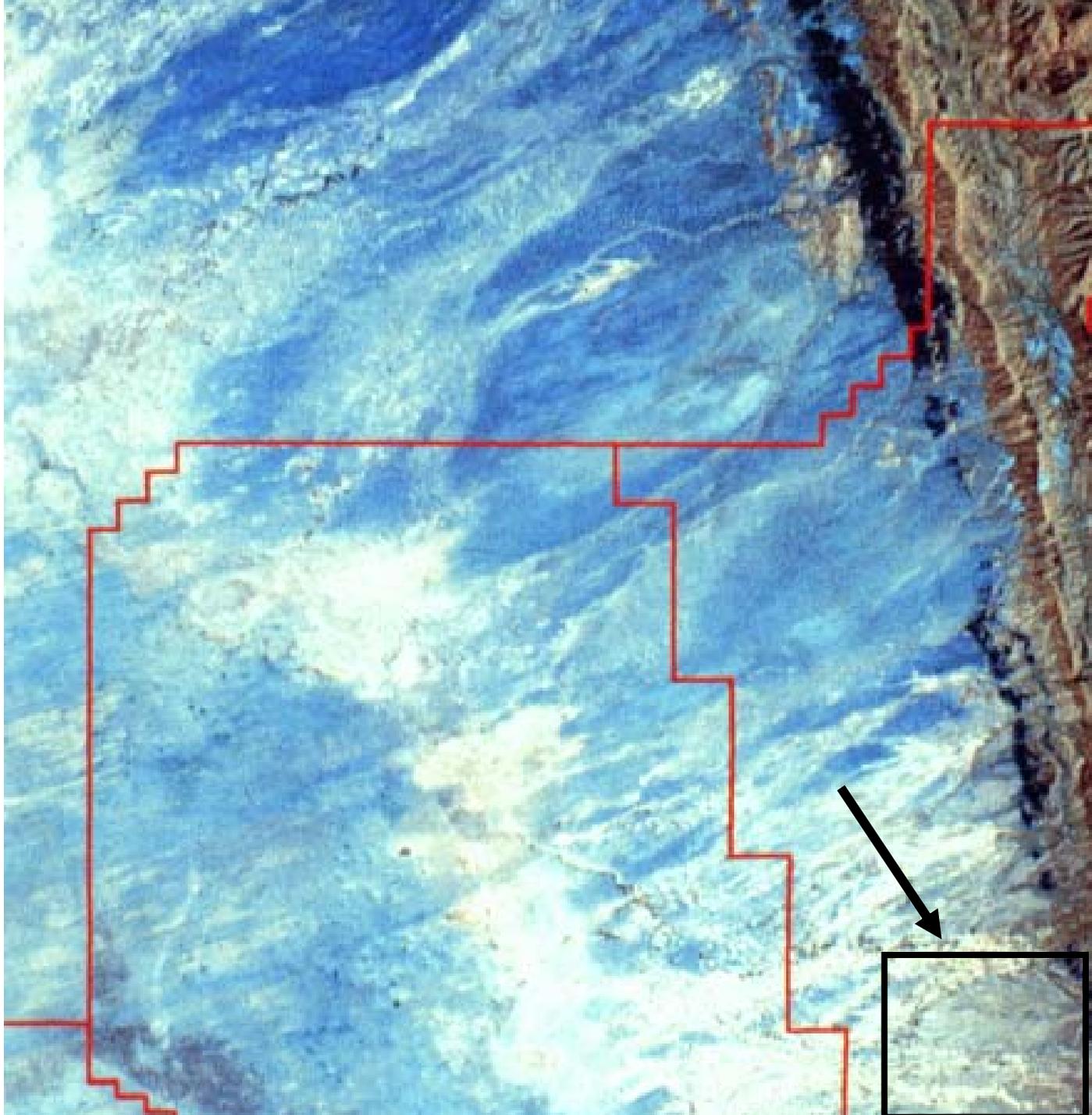
Las Cruces



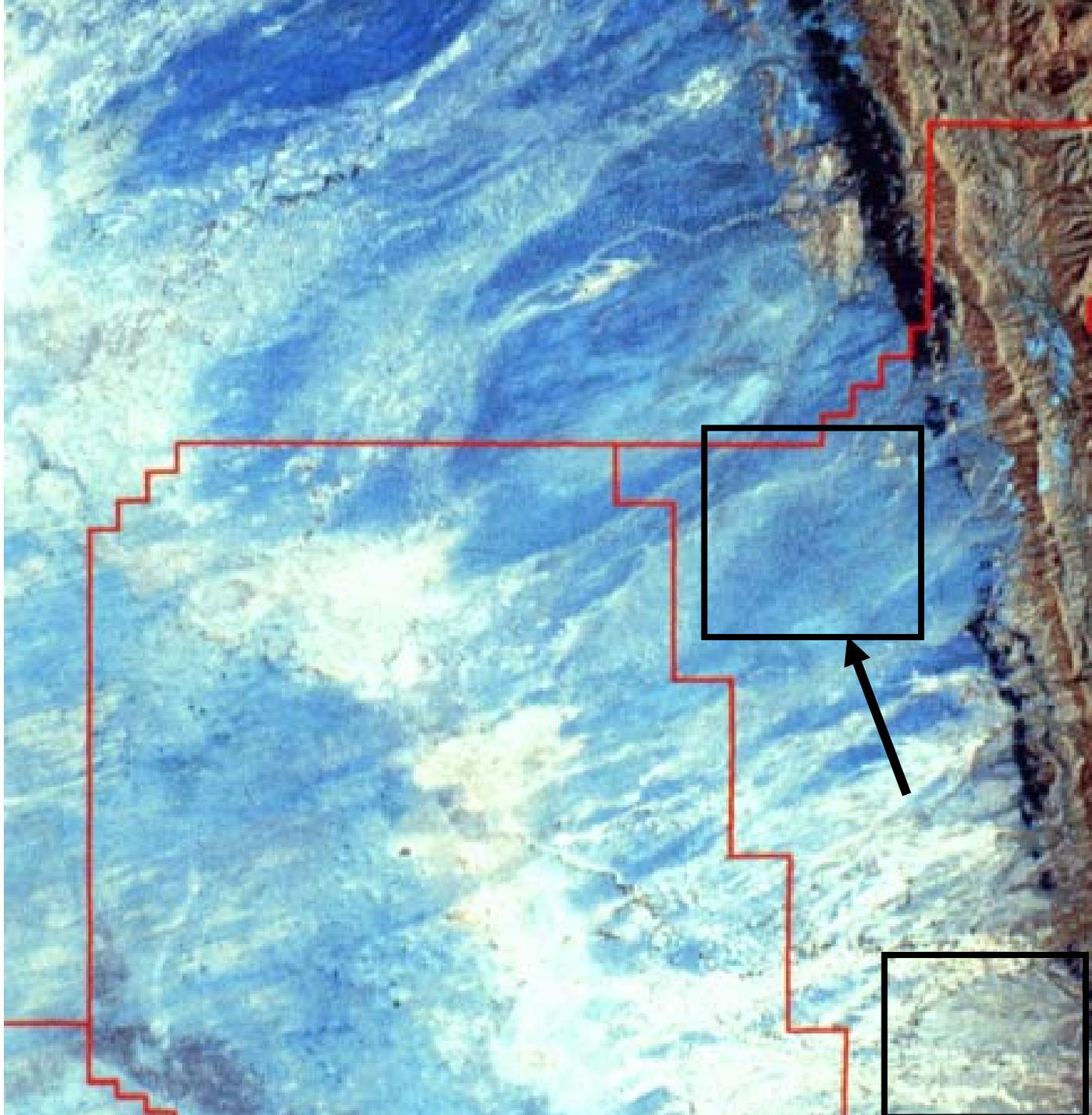












10-12-80

10:30

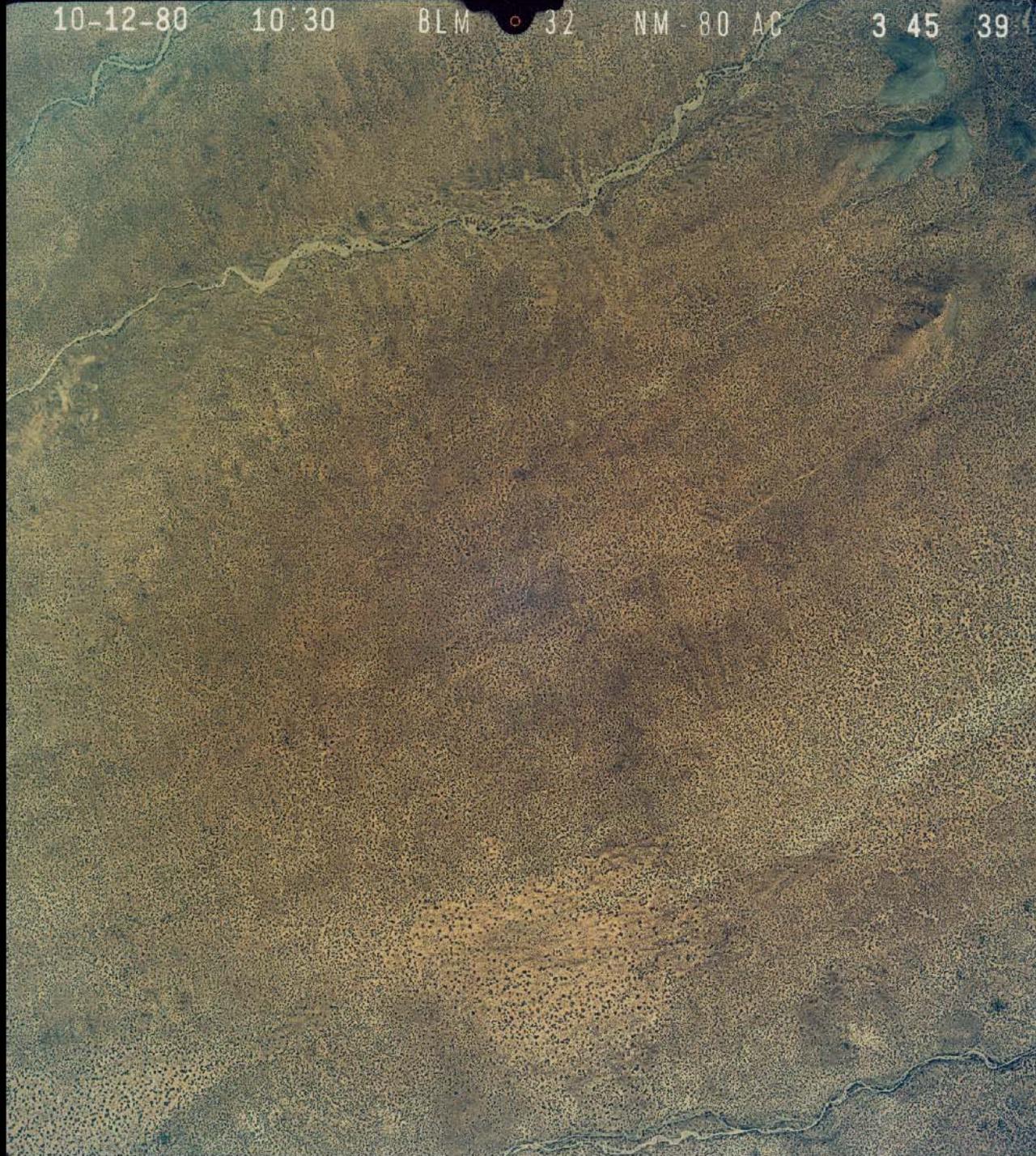
BLM

32

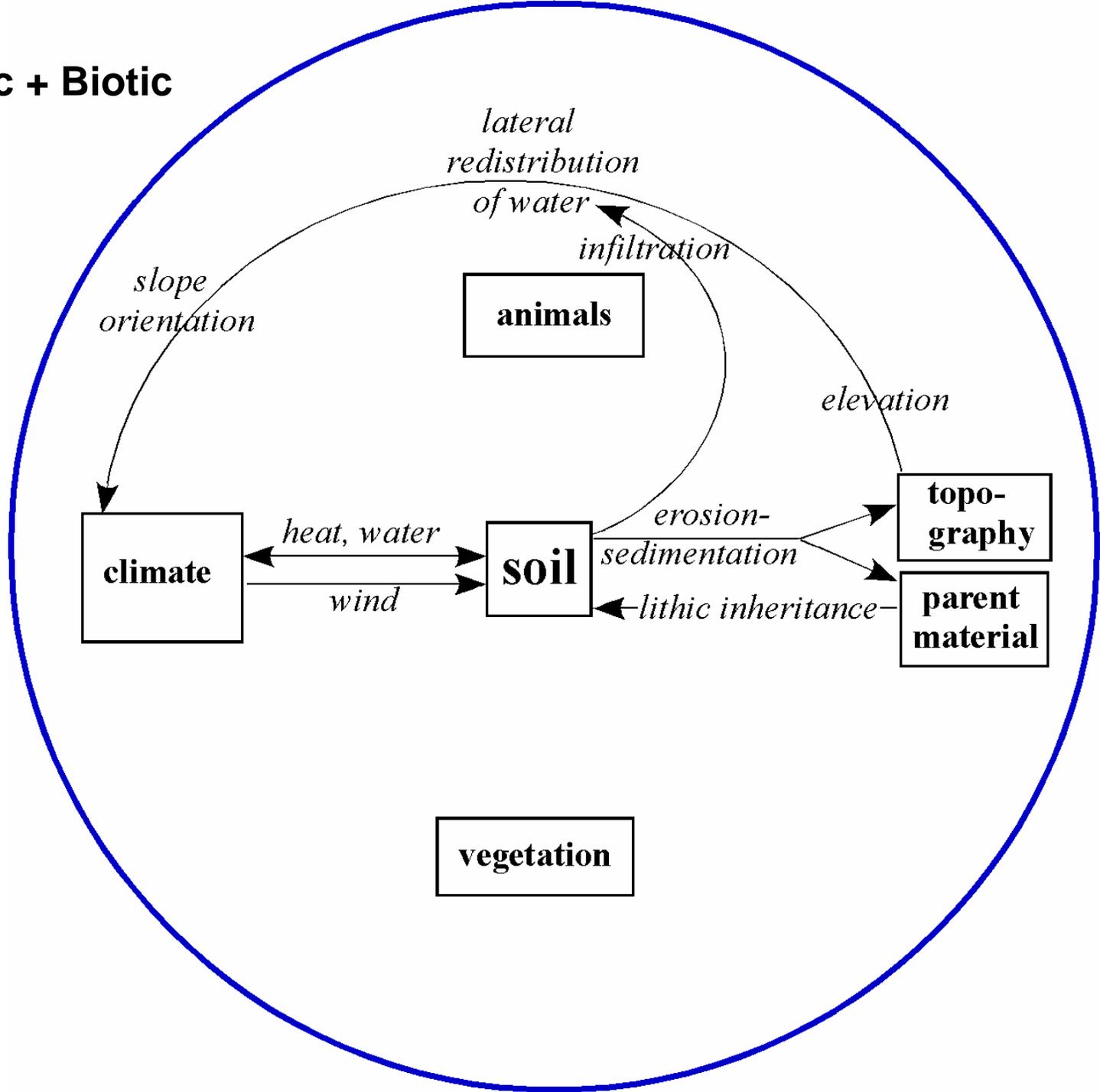
NM-80 AC

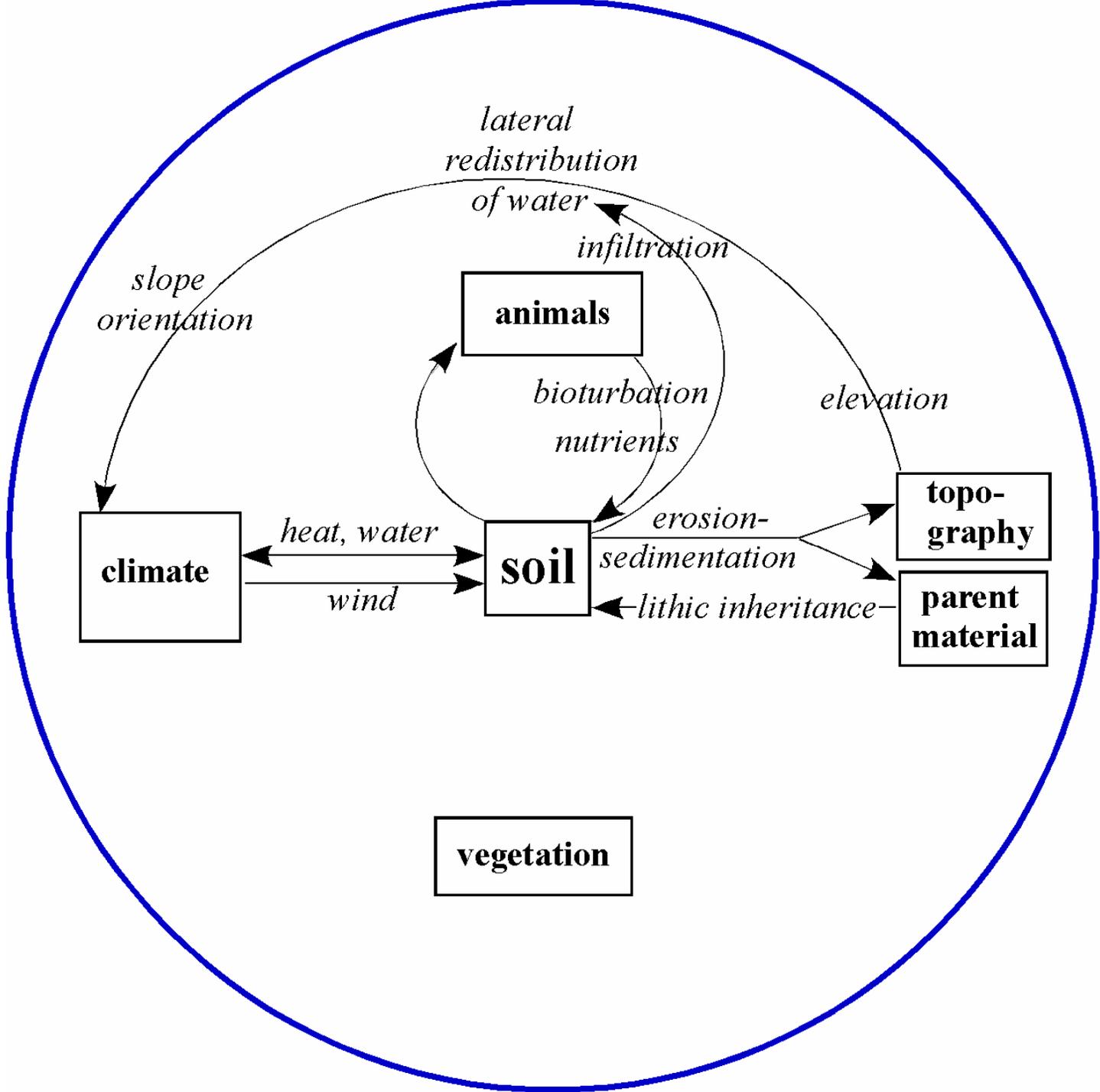
3 45

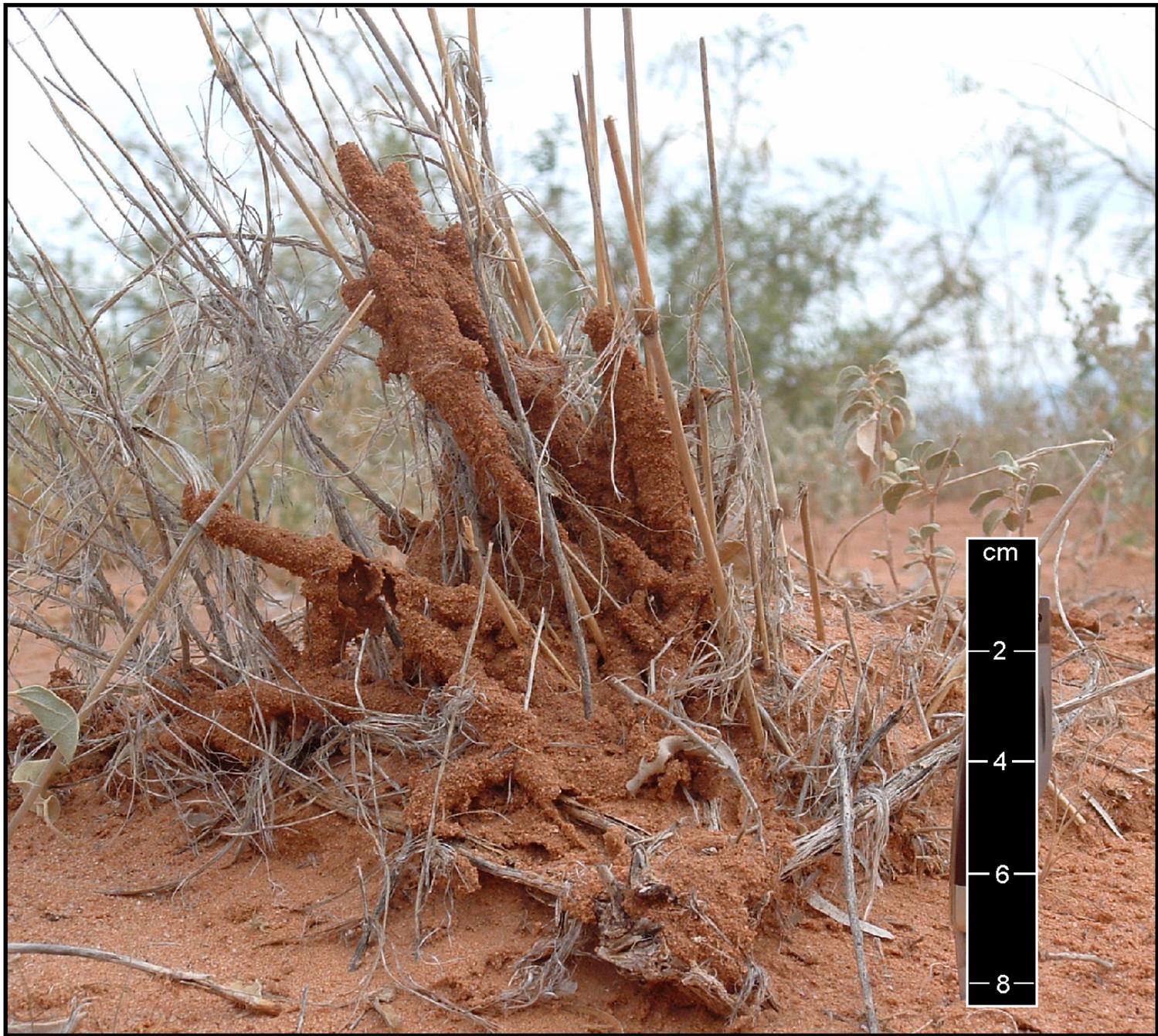
39

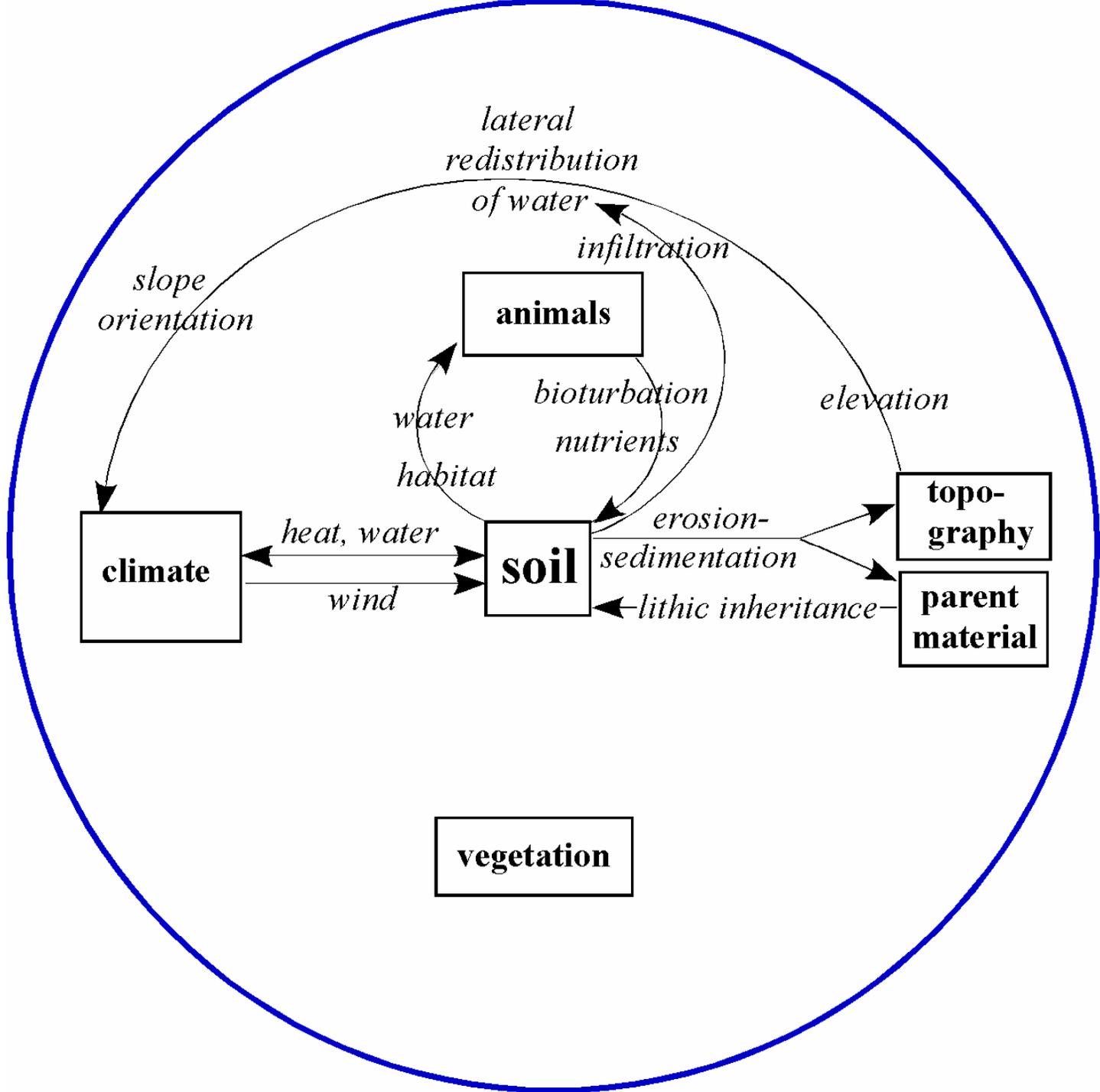


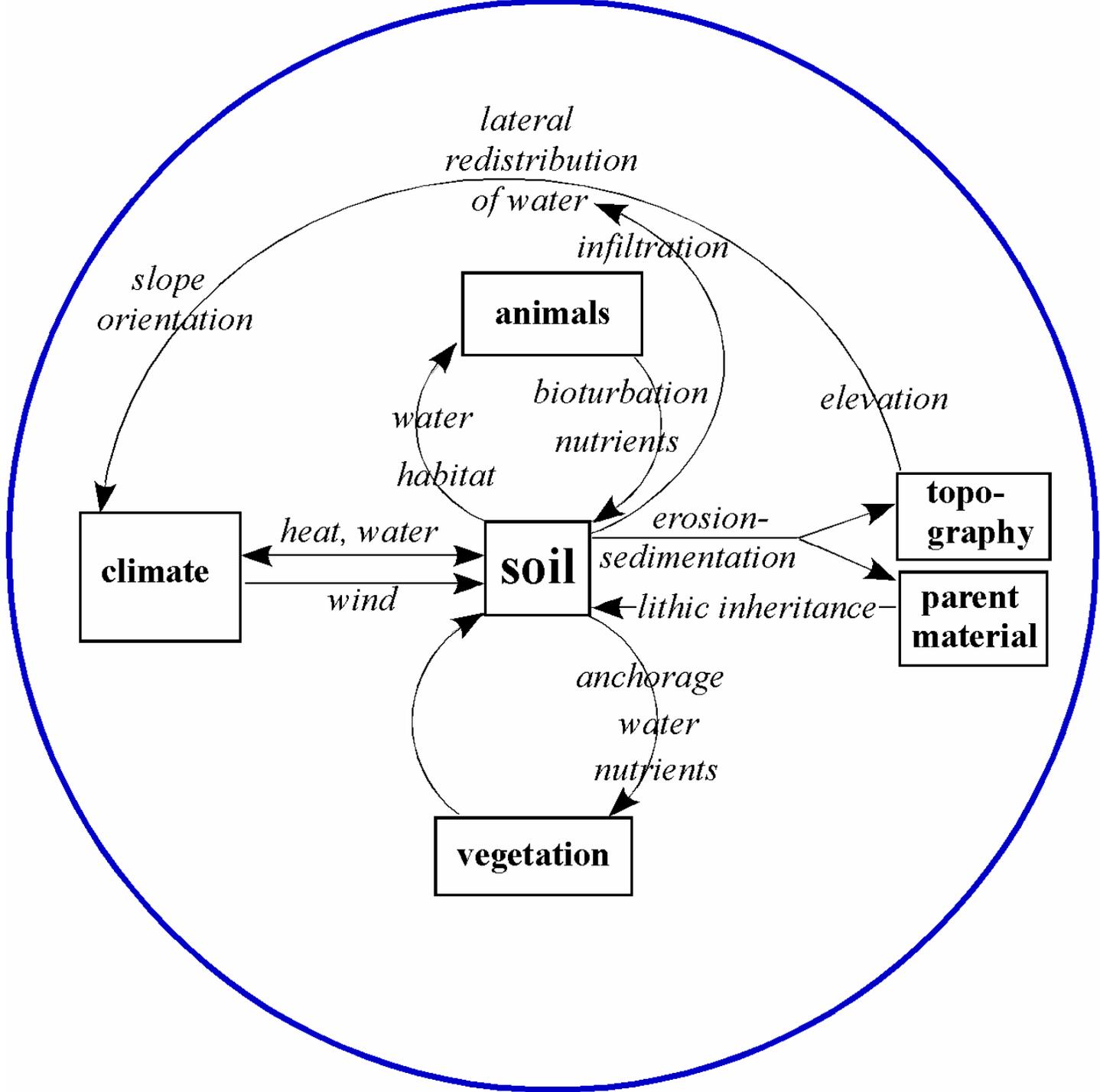
Abiotic + Biotic

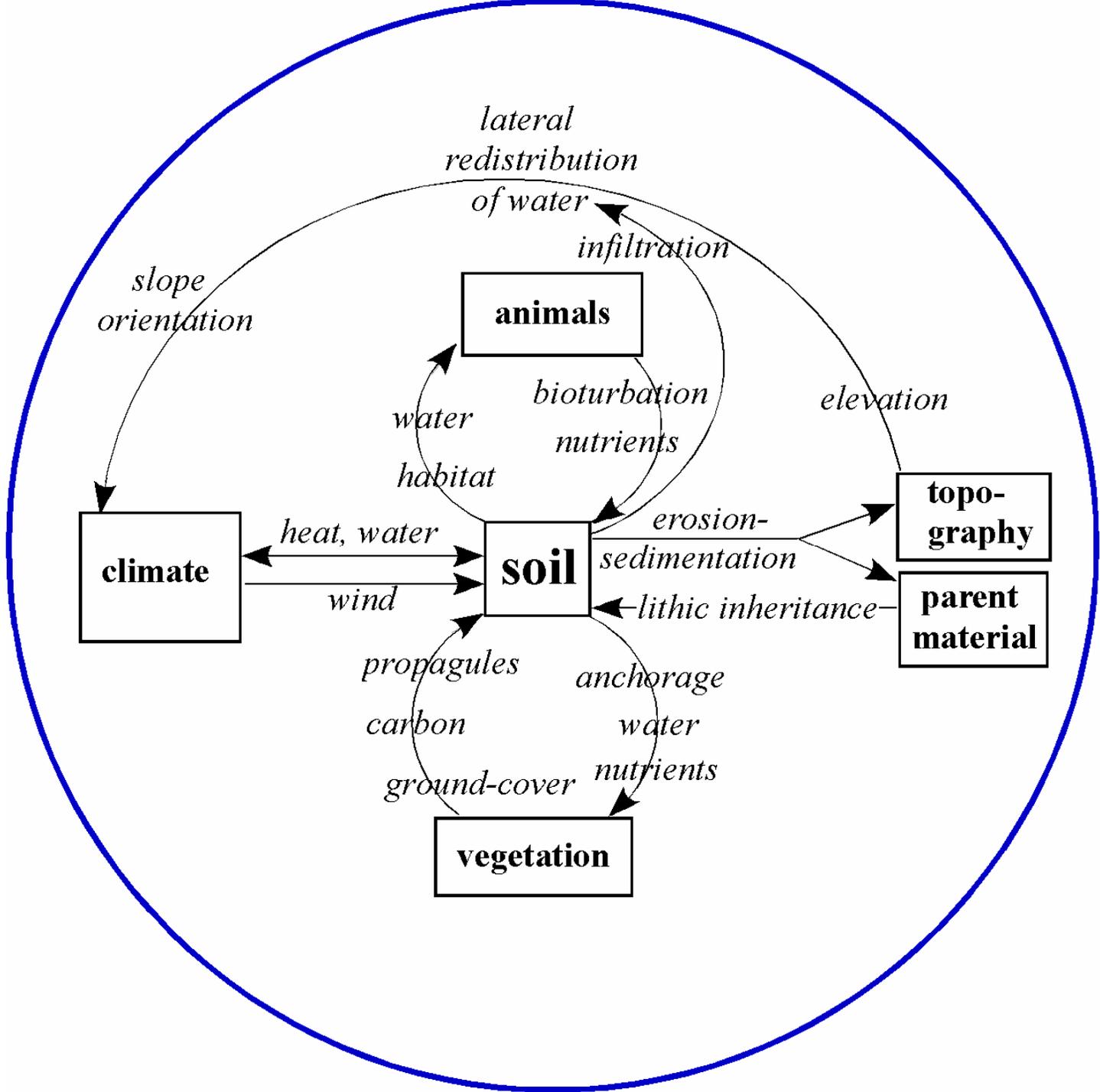




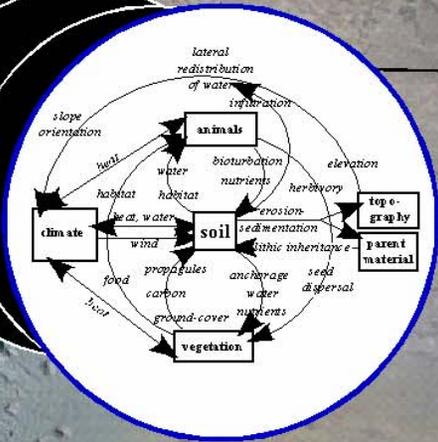






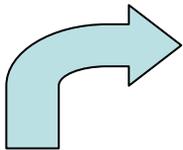
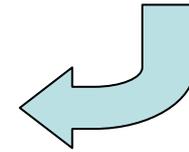


Time





Before Desertification

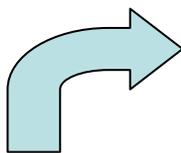
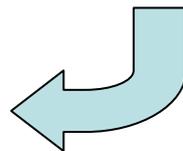


After Desertification

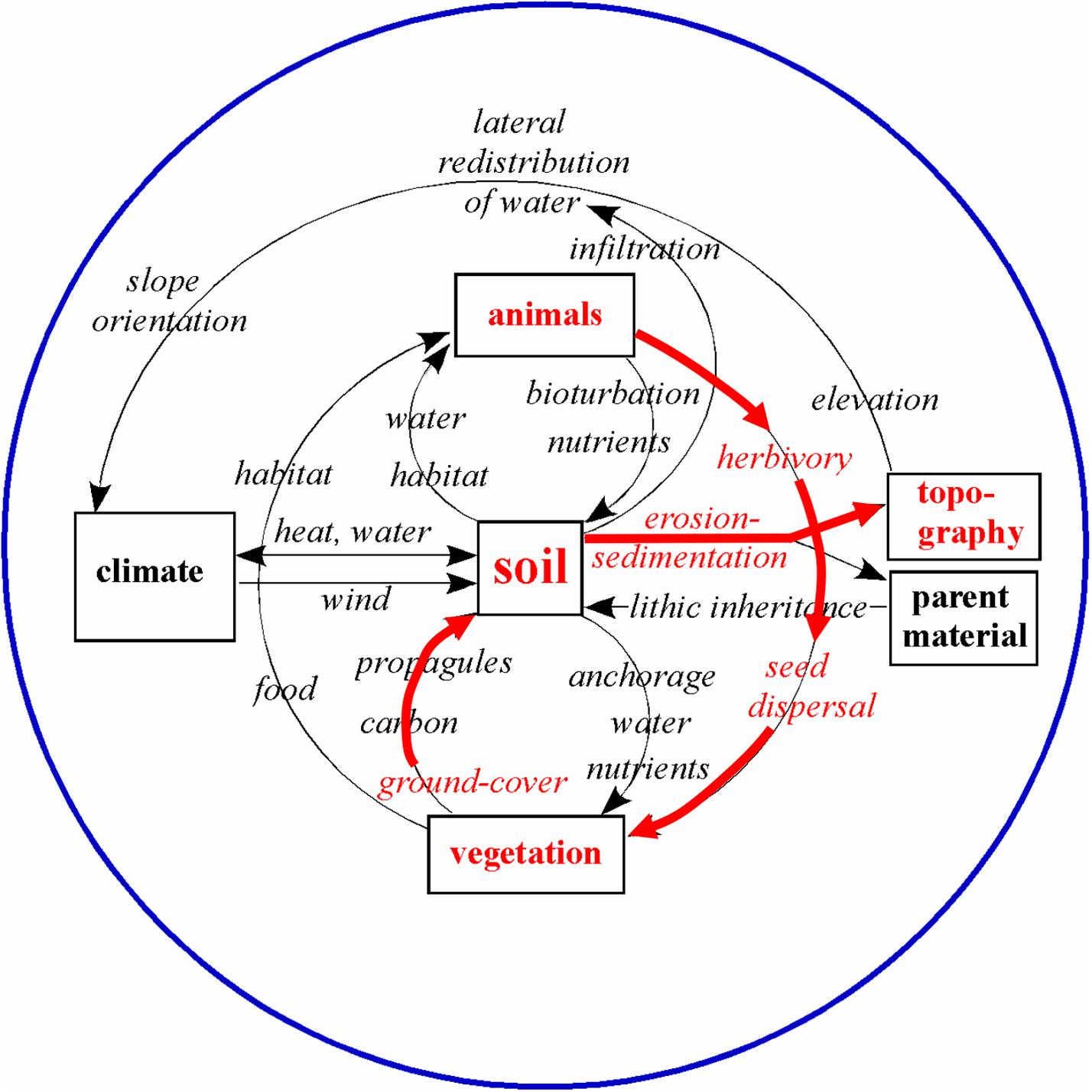




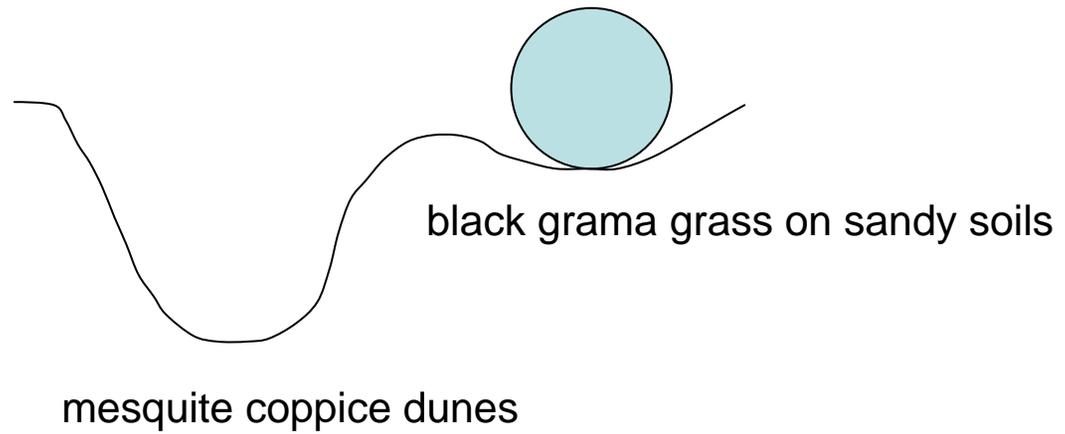
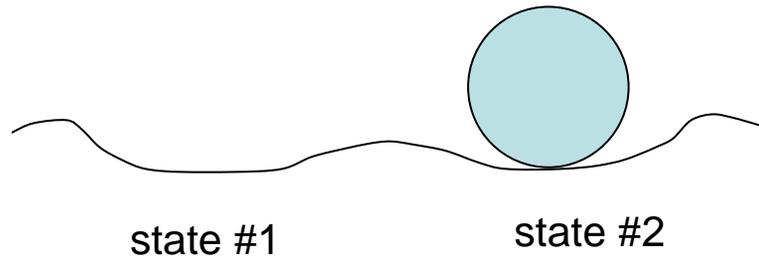
Before Desertification



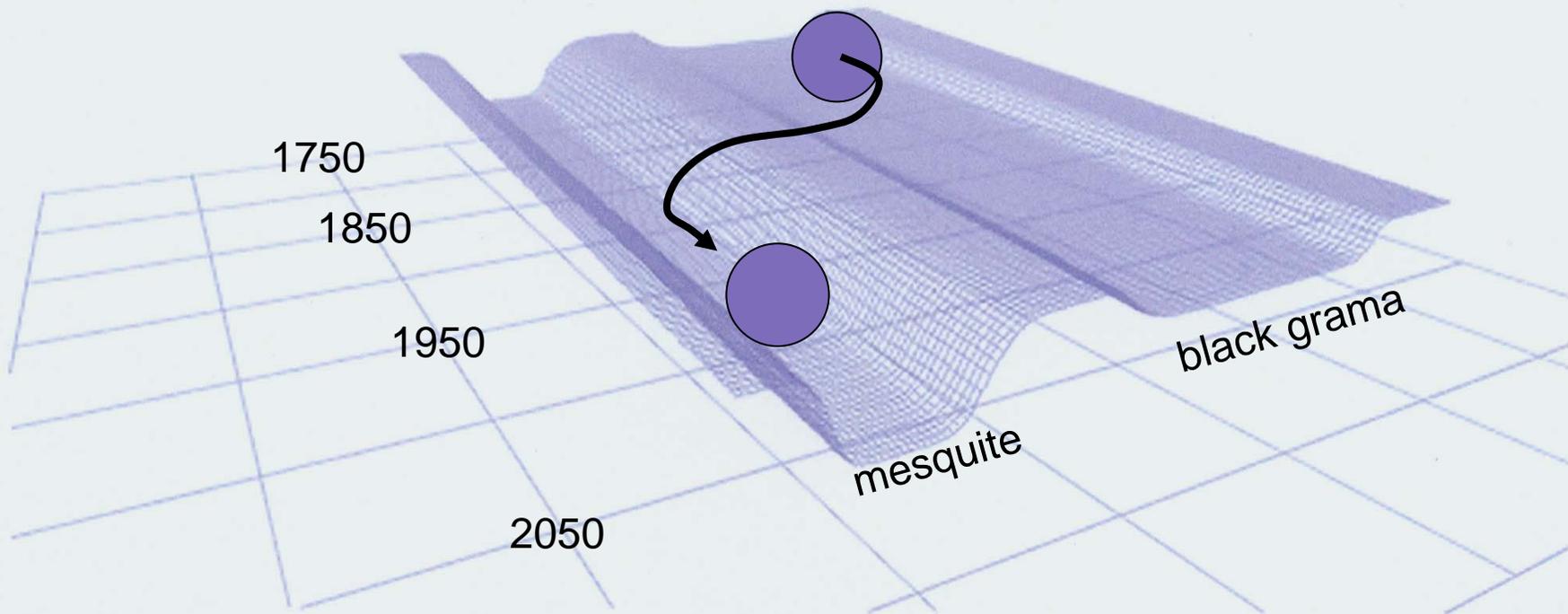
After Desertification



Desertification States



Sandy Basin Floor Site



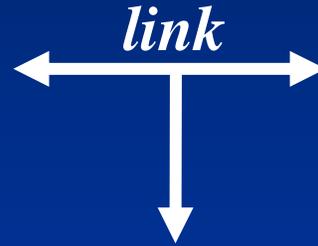
**Soil-geomorphic
change**



Desertification



**Soil-geomorphic
change**



Desertification

*interacting, interrelated,
interdependent system*



