AGROCLIMATIC ZONING FOR WINTER BARLEY IN KOREA UNDER THE RCP8.5 PROJECTED CLIMATIC CONDITION

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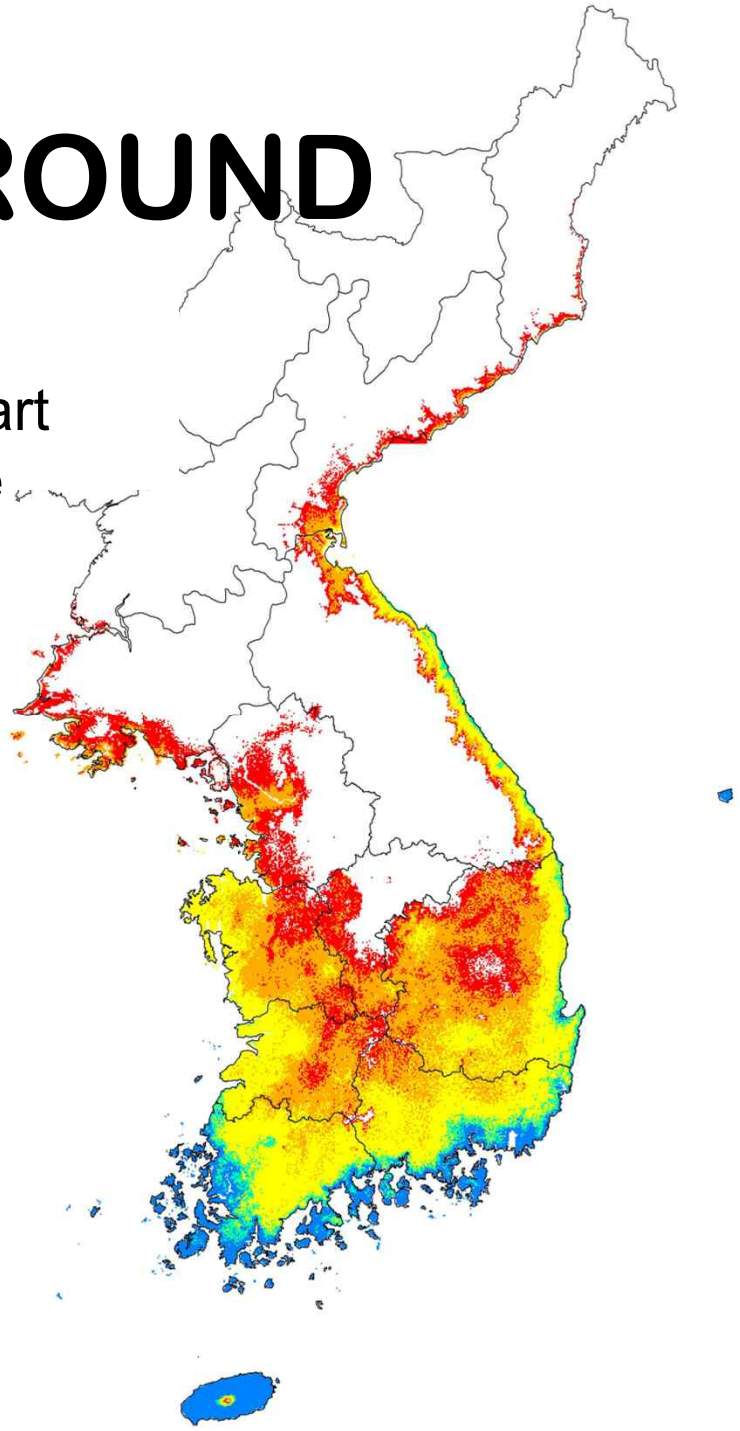
1. BACKGROUND

- Current winter barley cultivation zone is confined to the southern part of the Korean Peninsula due to the winter cold

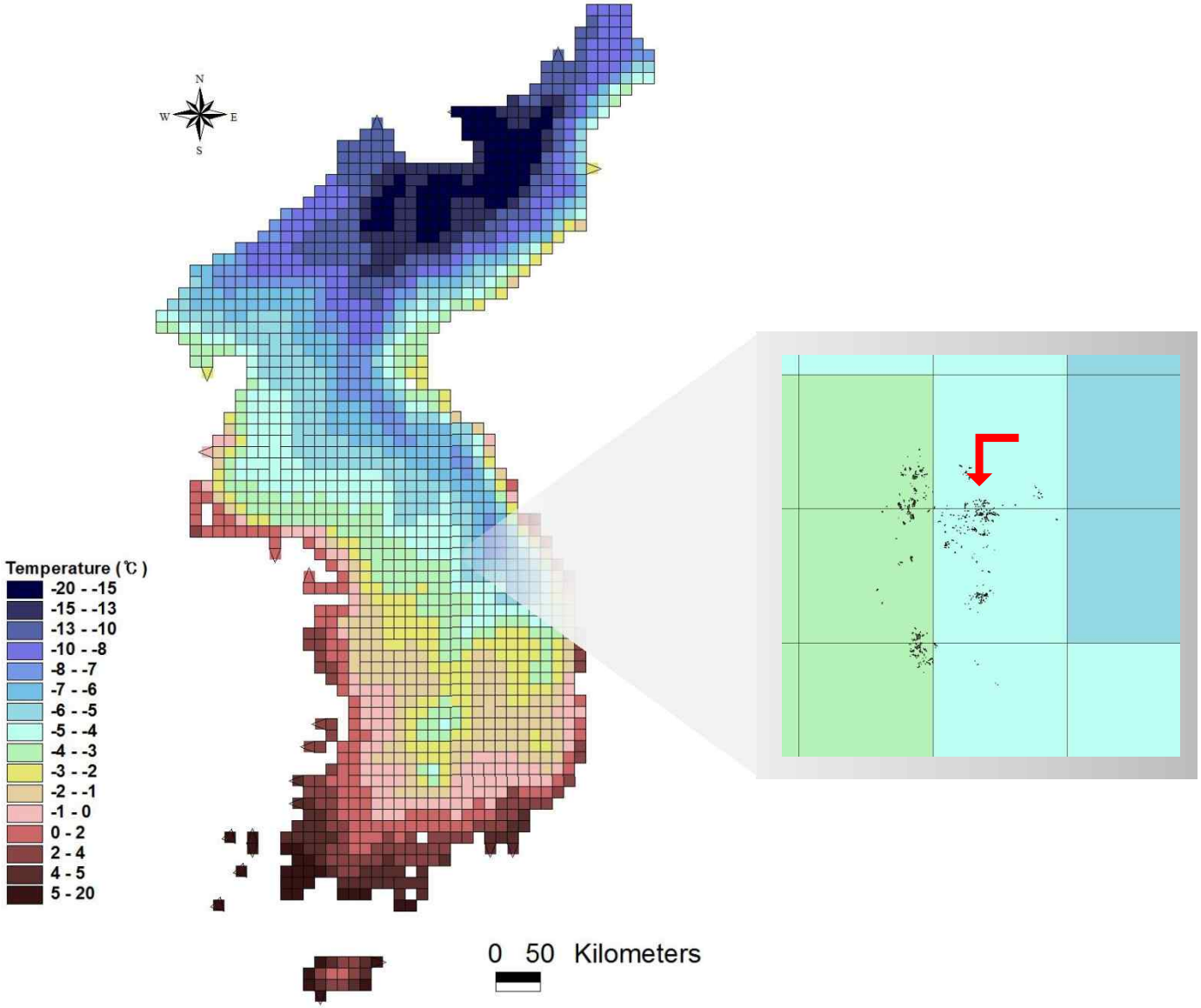


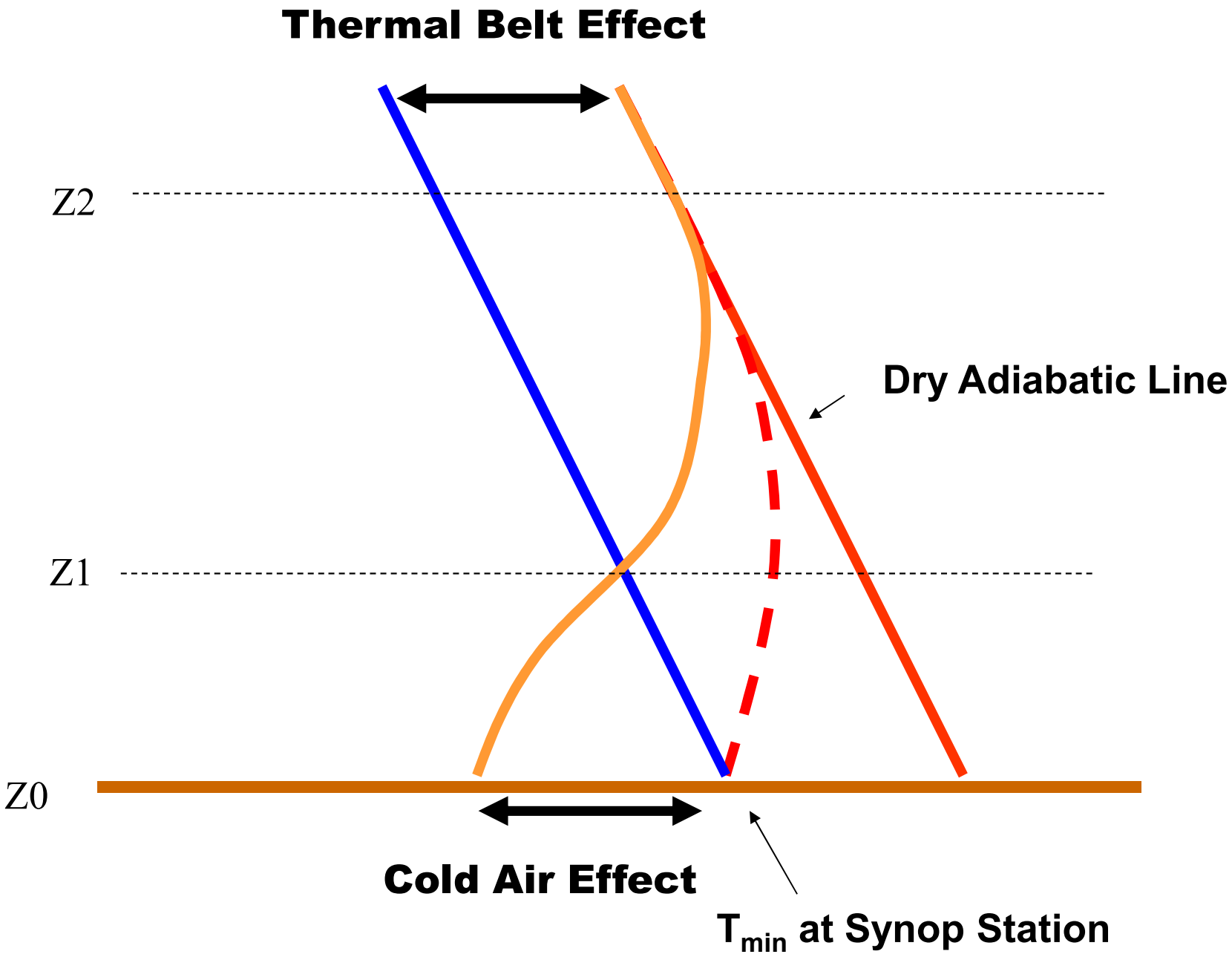
Acreage: 24,374 ha
Production: 76,856 M/T
(South Korea, 2007)

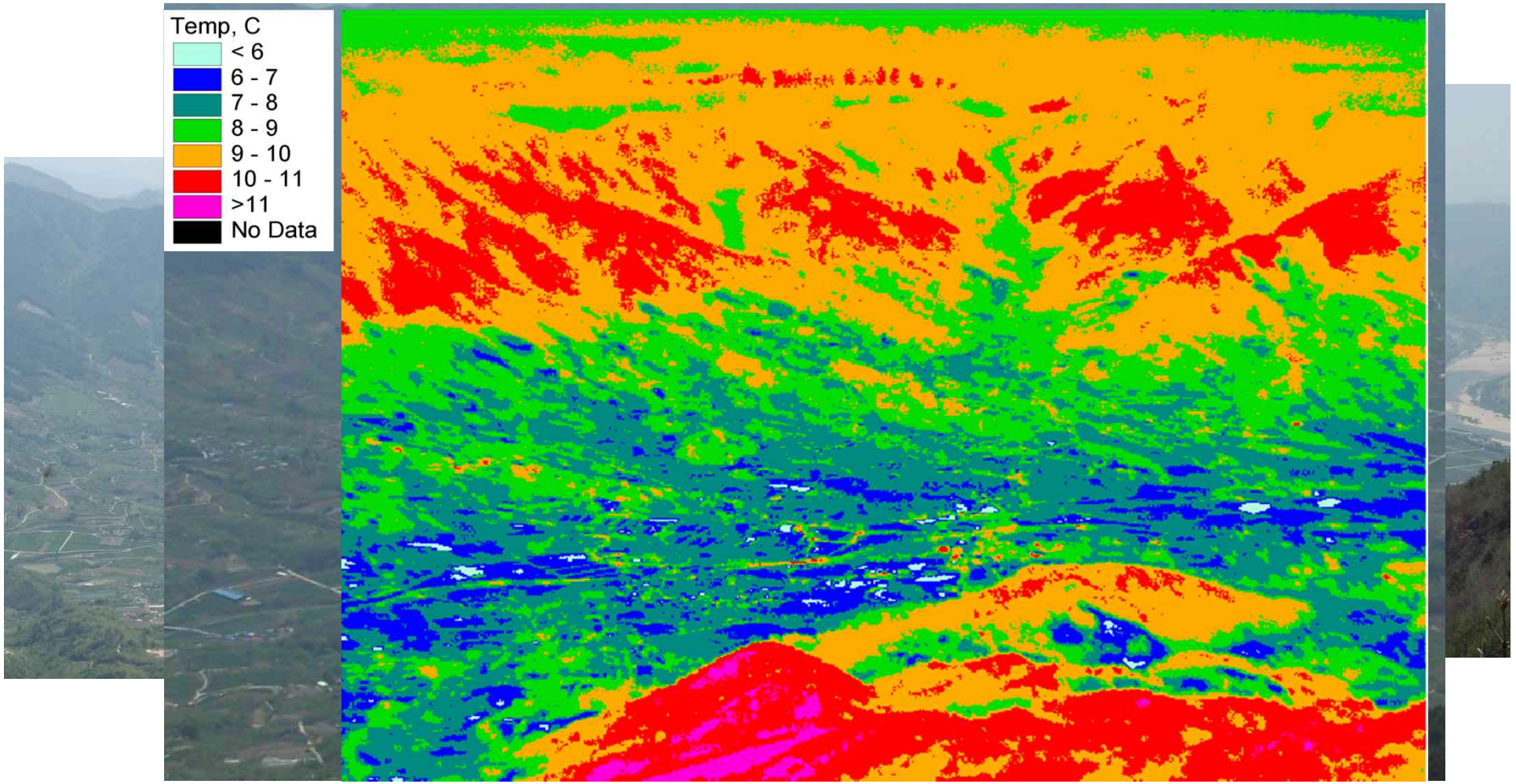
1. BACKGROUND

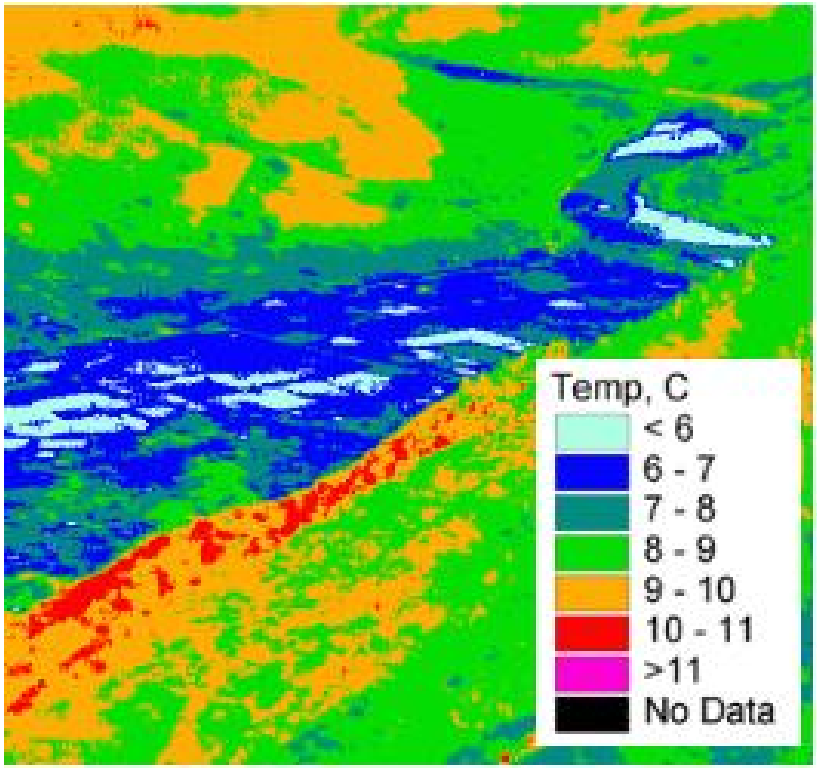
- Current cultivation zone is confined to the southern part of the Korean Peninsula due to the winter cold
- Winter barley shows a positive response to the climate change
- Northern limit for safely growing winter barley already shifted toward north due to the recent winter warming
- Geographical migration of arable lands suitable for winter barley production must be known in advance for adaptation measures to climate change

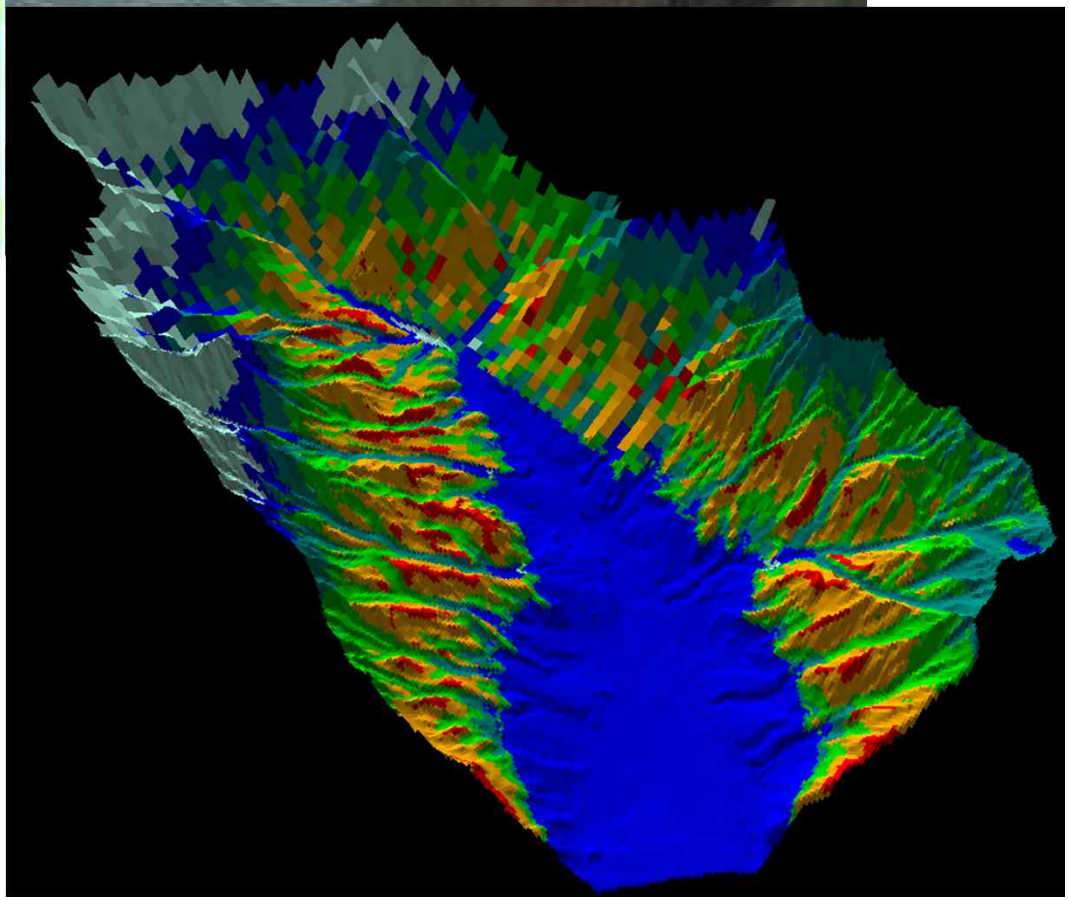
2. GEOSPATIAL CLIMATE DATA



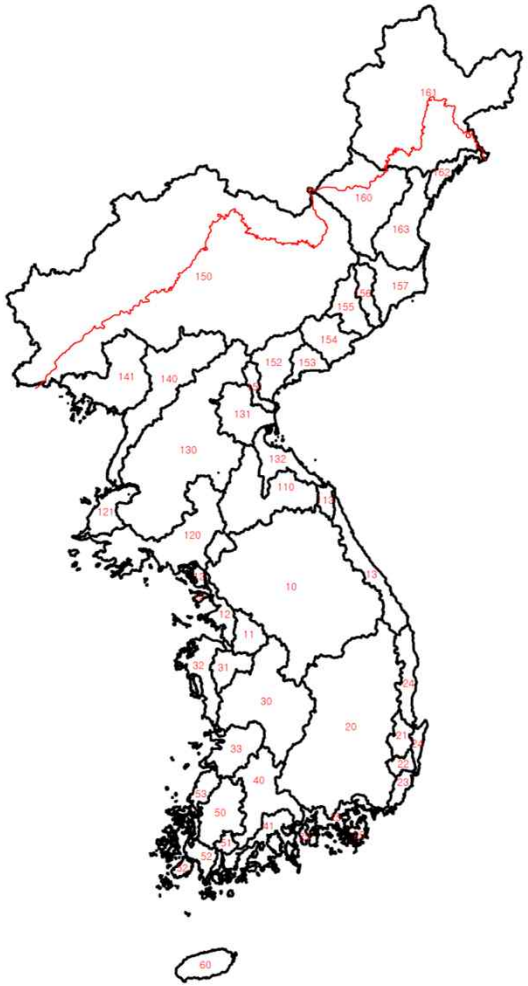

Thermal Belt Effect
Z2
Z1
Z0
Dry Adiabatic Line
Cold Air Effect
T_{min} at Synop Station


Temp, C
< 6
6 - 7
7 - 8
8 - 9
9 - 10
10 - 11
>11
No Data

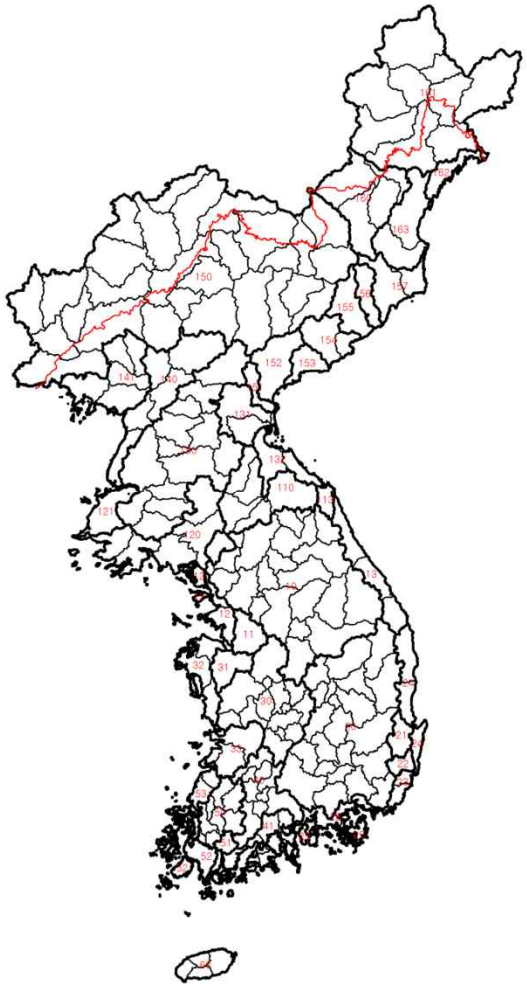

Temp, C
< 6
6 - 7
7 - 8
8 - 9
9 - 10
10 - 11
>11
No Data



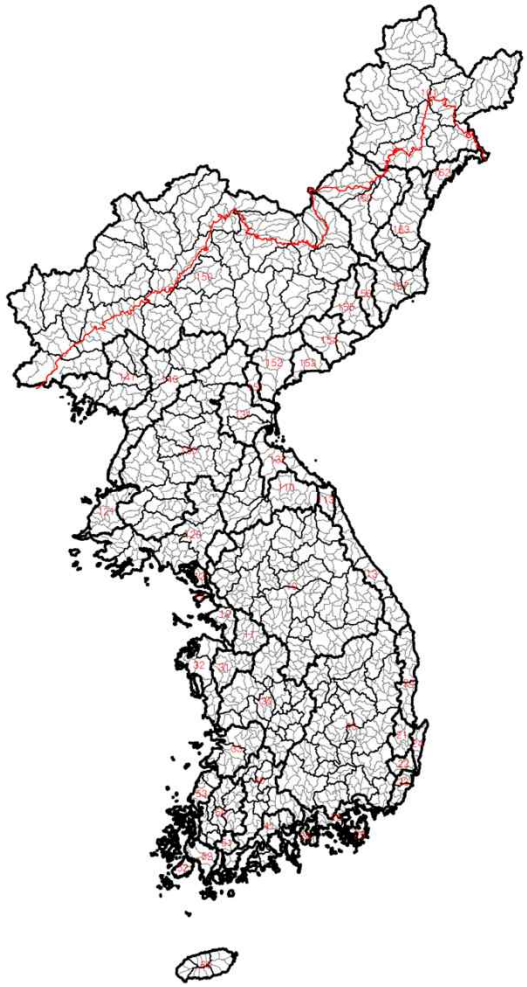
Hydrological Classification for the Korean Peninsula



42 river basins



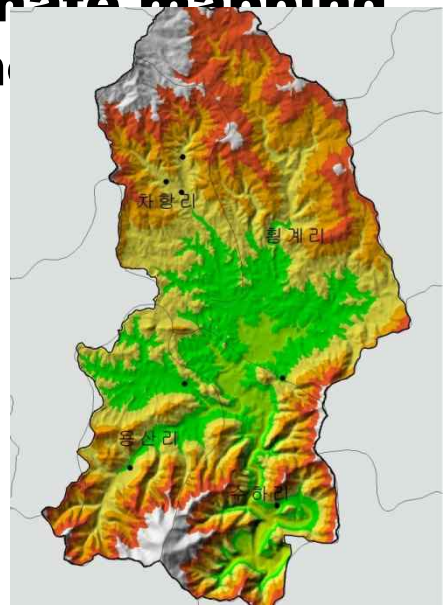
220 watersheds

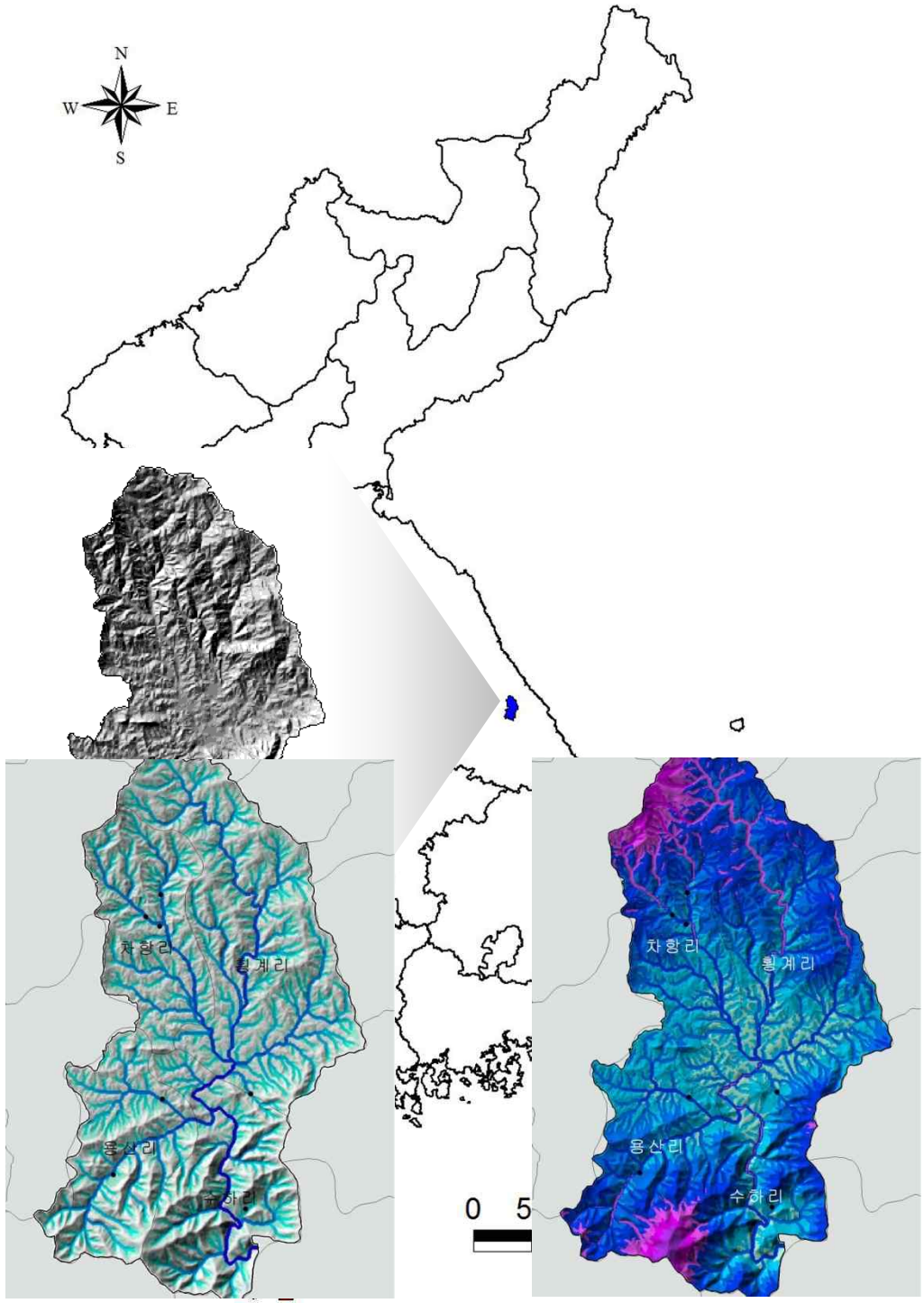


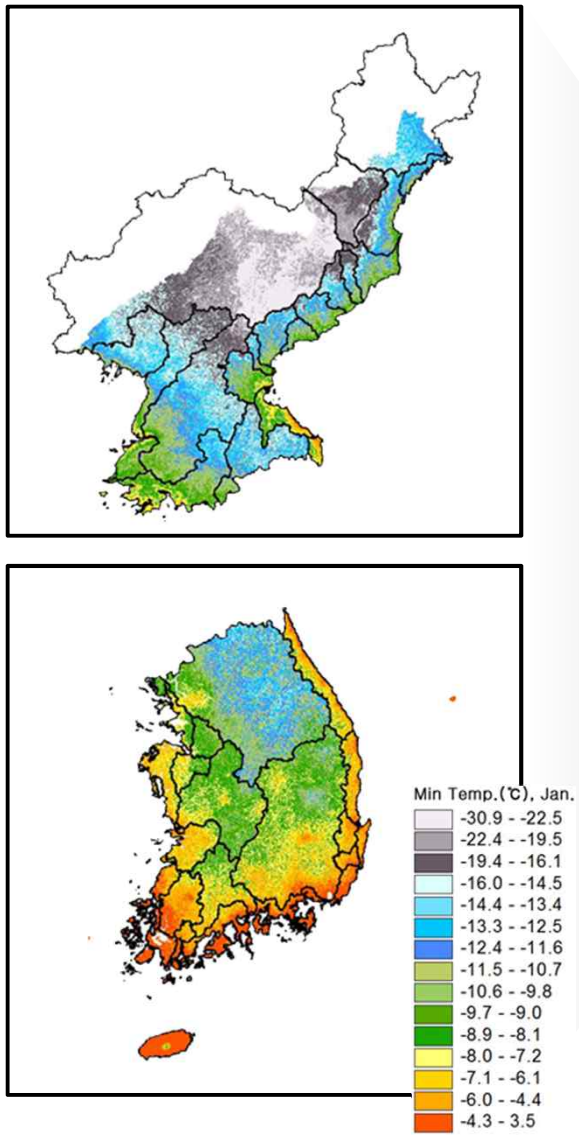
1,695 catchments

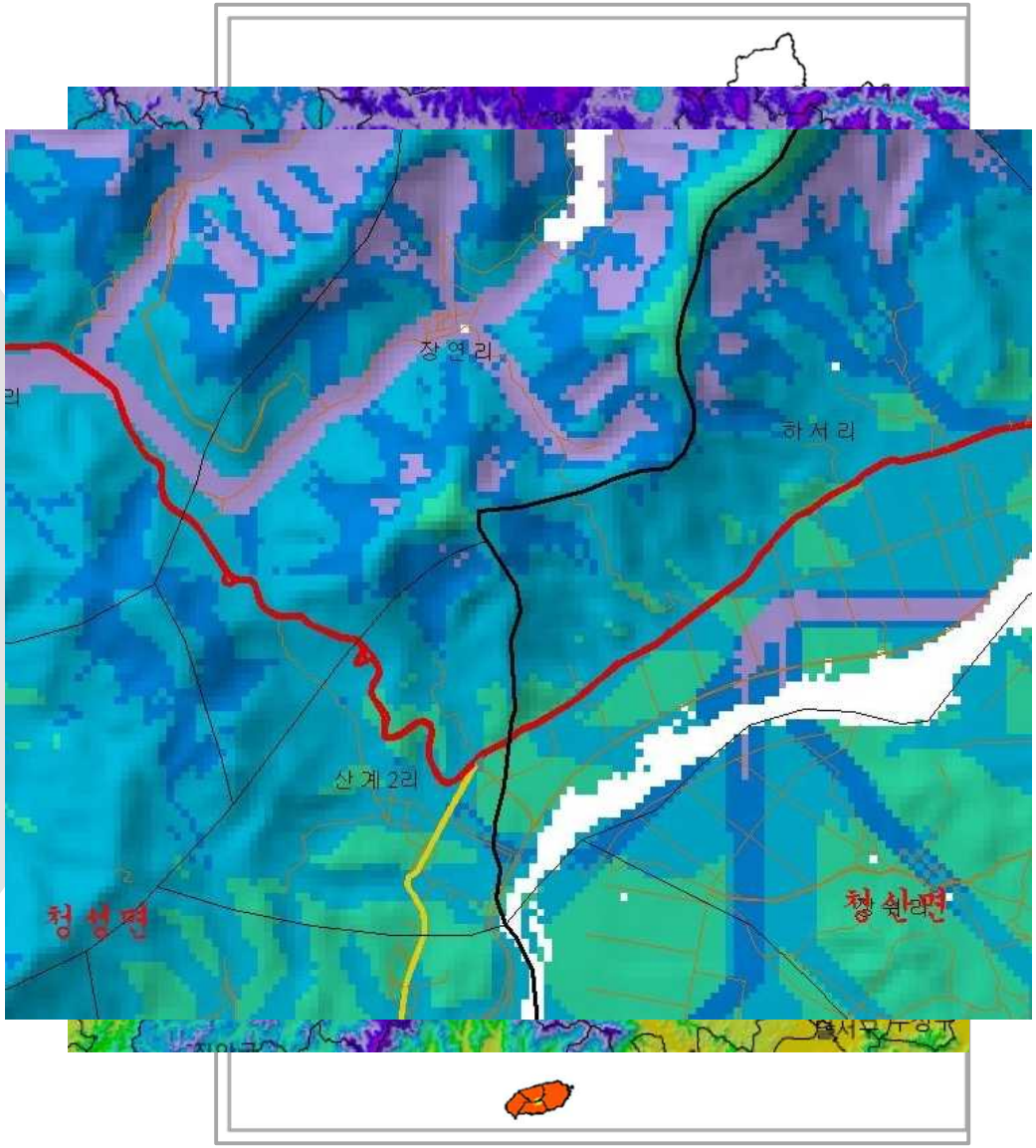
Observed data from Korea Meteorological Administration's synoptic weather stations

A catchment-specific climate mapping sch



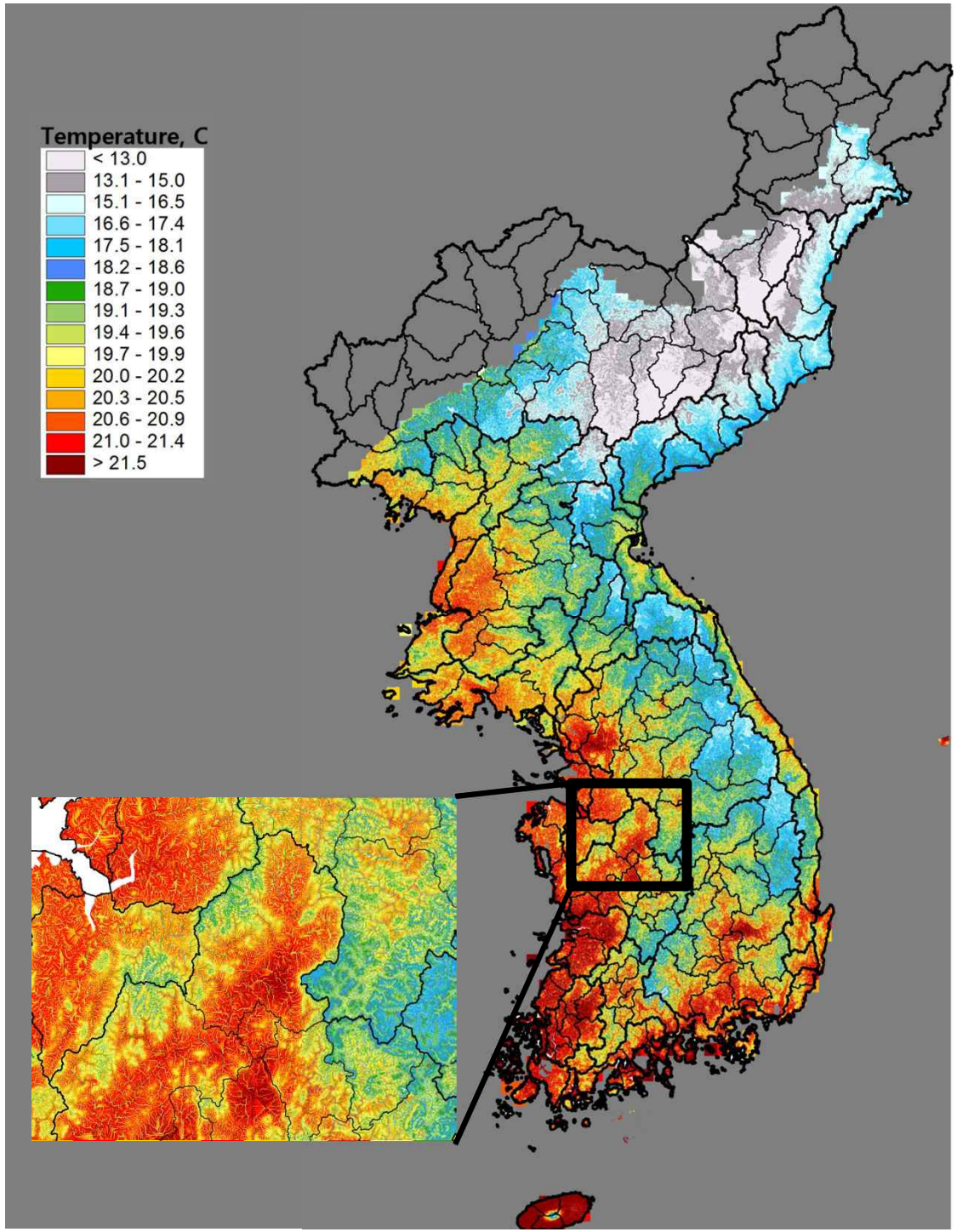



Min Temp.(℃), Jan.
-30.9 - -22.5
-22.4 - -19.5
-19.4 - -16.1
-16.0 - -14.5
-14.4 - -13.4
-13.3 - -12.5
-12.4 - -11.6
-11.5 - -10.7
-10.6 - -9.8
-9.7 - -9.0
-8.9 - -8.1
-8.0 - -7.2
-7.1 - -6.1
-6.0 - -4.4
-4.3 - 3.5

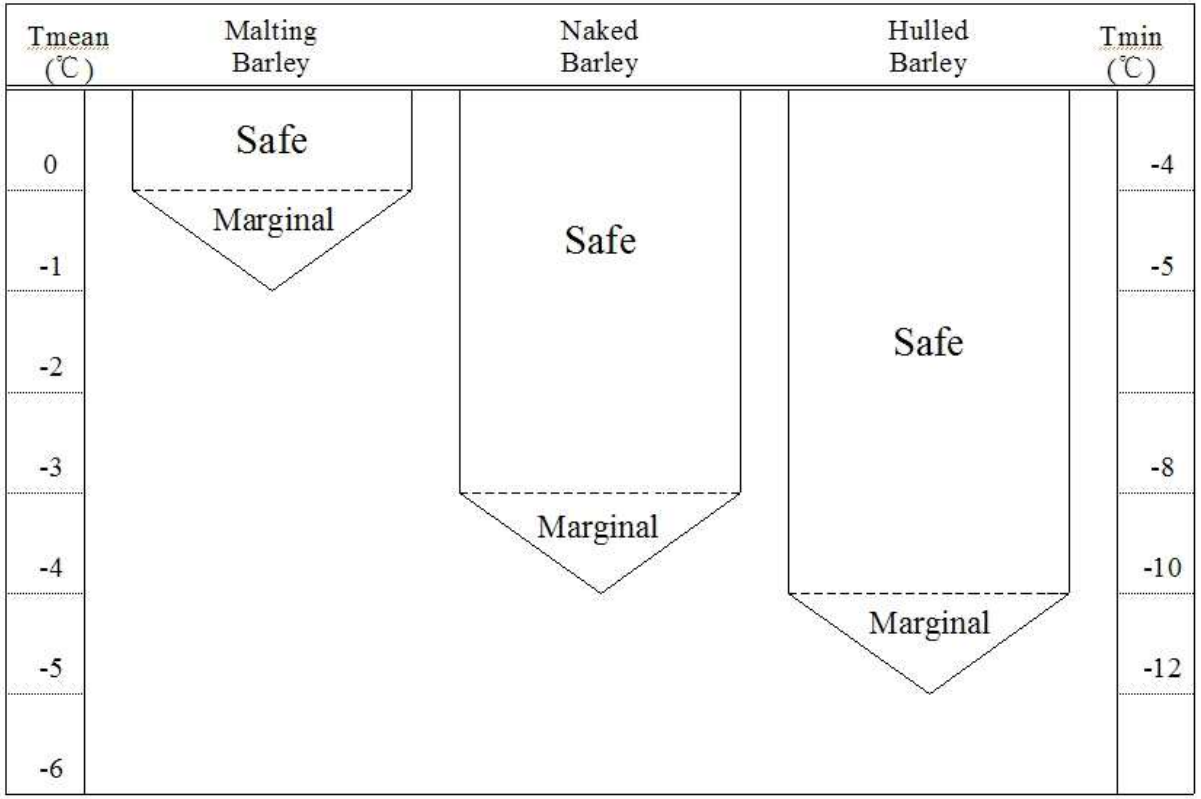

창연리
하서리
산계2리
청성면
청송면

RCP8.5 scenario overlaid

- Products from Korea Meteorological Administration (KMA)
- 12.5km resolution
- Decadal averages for 2011-2100



3. COLD HARDINESS CRITERION



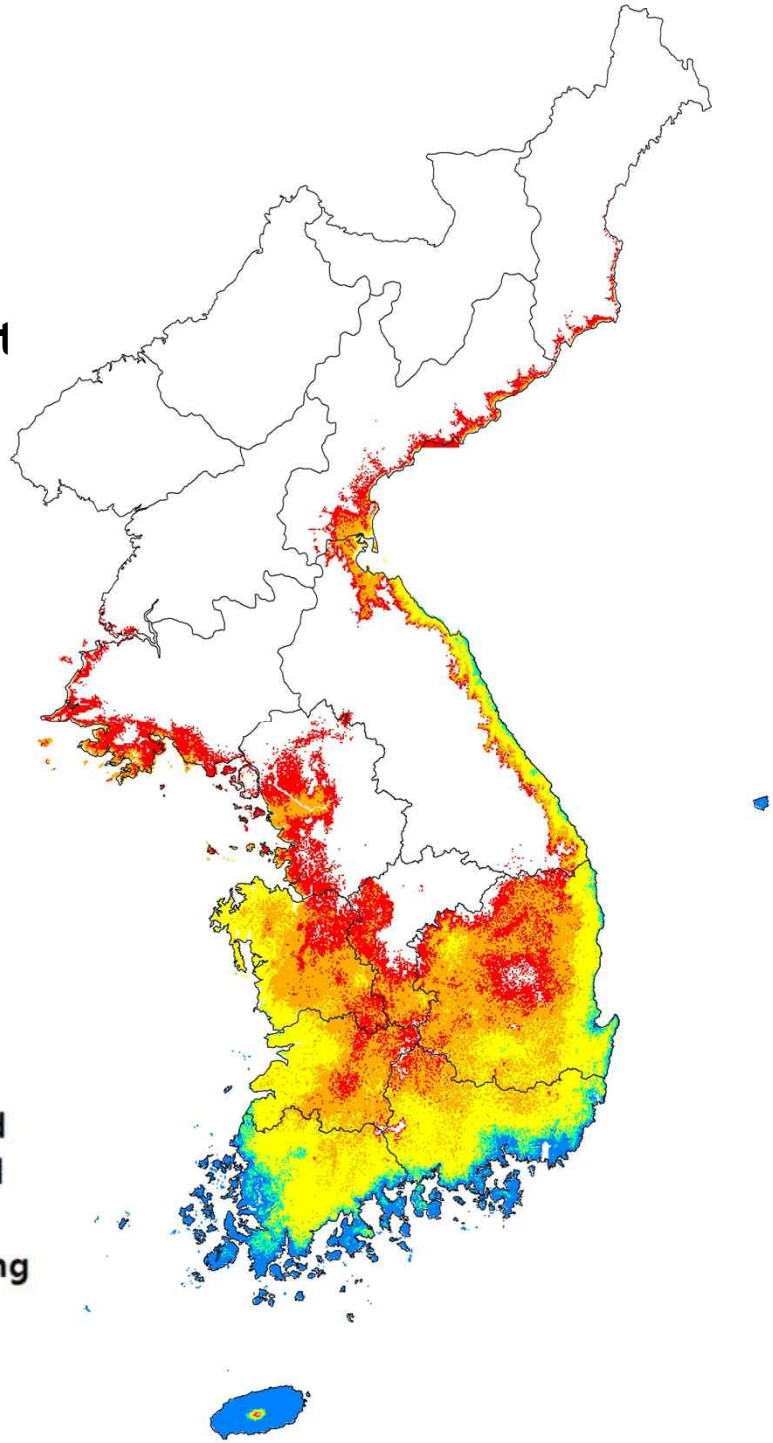
Cold hardiness criteria for 3 major barley cultivars for delineating northern growth limits

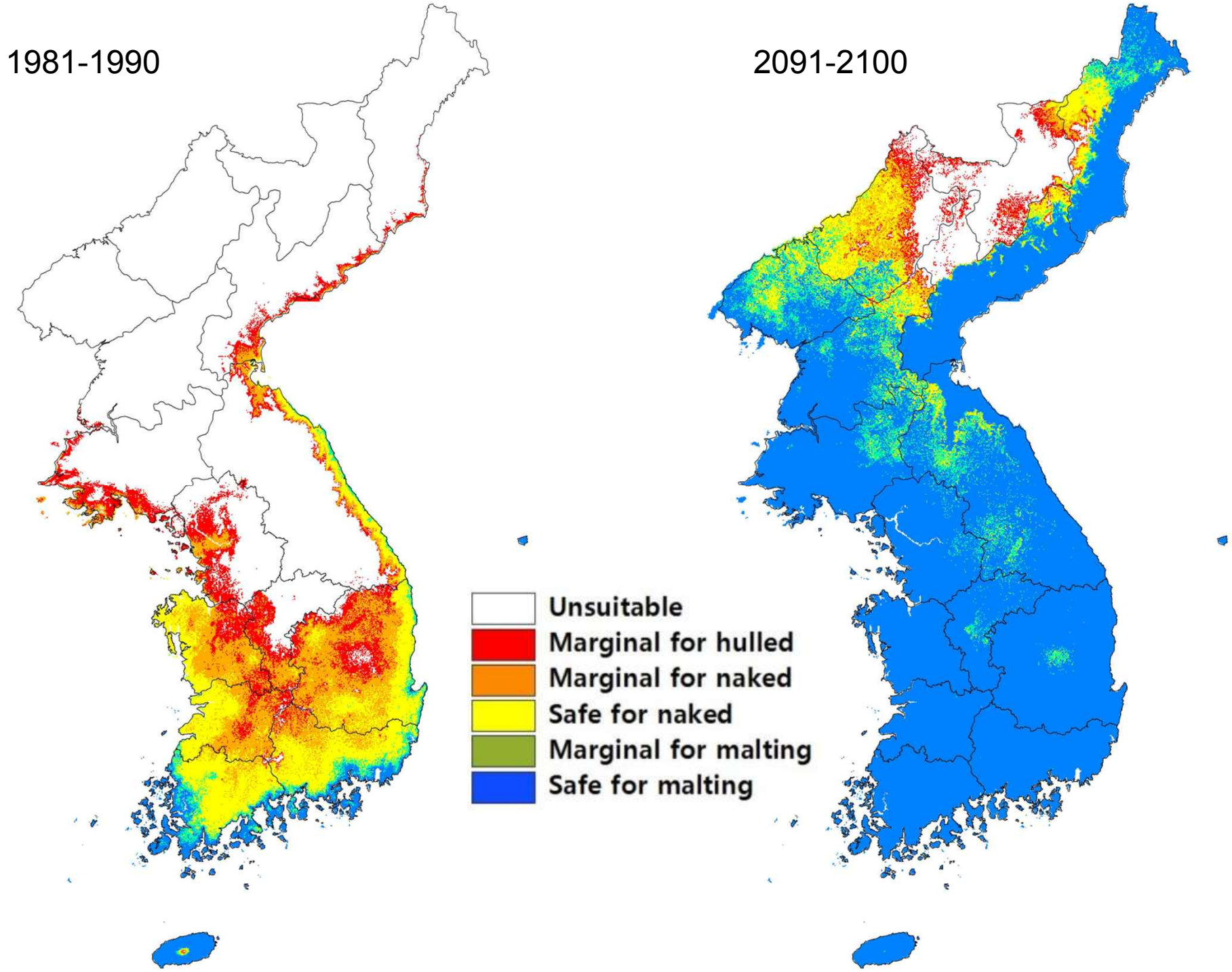
4. RESULTS

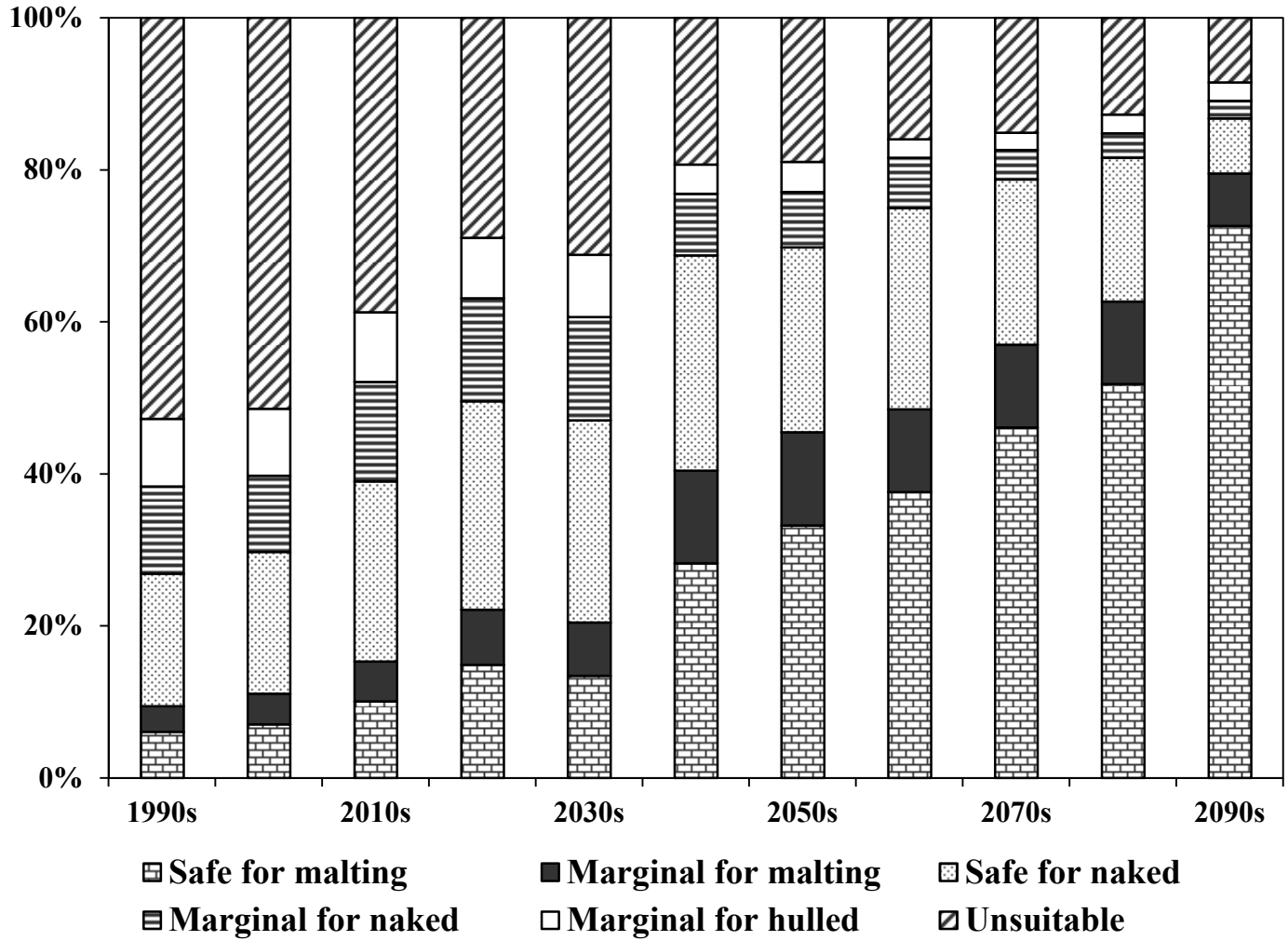
Geographical shift of northern limit and arable lands for winter barley

1980s → 1990s → 2000s → ...

... → 2080s → 2090s




1981-1990
2091-2100
Unsuitable
Marginal for hulled
Marginal for naked
Safe for naked
Marginal for malting
Safe for malting



Changes in arable land area available for growing winter barley cultivars under the RCP8.5 projected climate condition

5. DISCUSSION

- Potential grain production will decrease from 15 million tons in 2000s to 12 million tons in 2090s by rice monoculture at all arable lands in South Korea, but it will increase from 10 million tons in 2000s to 17 million tons in 2090s by winter barley at all the acreage (Kim et al., 2012)

- Planting hulled barley after summer crops at North Korean acreage in 2040s, at least 4 million tons of grains could be added to the recent estimates for North Korean grain production

- Additional studies on cropping systems using modeling techniques are necessary to delineate realistic effects of selecting alternative crops under the climate change scenarios

Kim, et al., 2012: Geographical migration of winter barley in Korea under the RCP8.5 projected climate condition. *Korean Journal of agricultural and Forest Meteorology* **14**, .

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Thank you