WATER NEXUS 2012

Connecting the Dots: The water, food, energy, and climate nexus

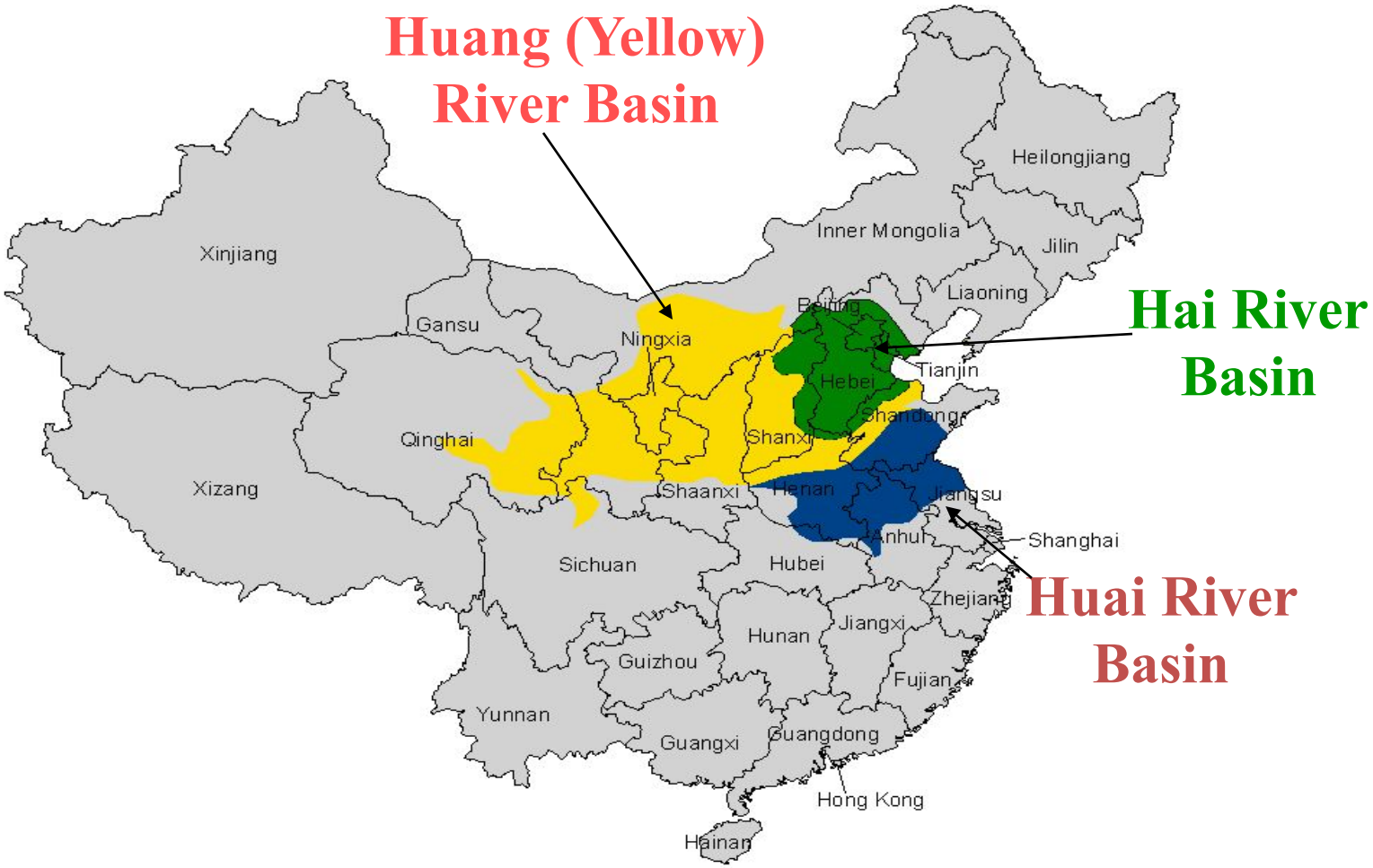
China: Water, Food, Climate, and Policy

Moderator: Jim Leckie

Panelists: Noah Diffenbaugh, David Lobell, and Jie Wang

Monday, April 16, 2012 | Frances C. Arrillaga Alumni Center | 326 Galvez Street | Stanford University

Acute Water Scarcity is Centered in Northern China



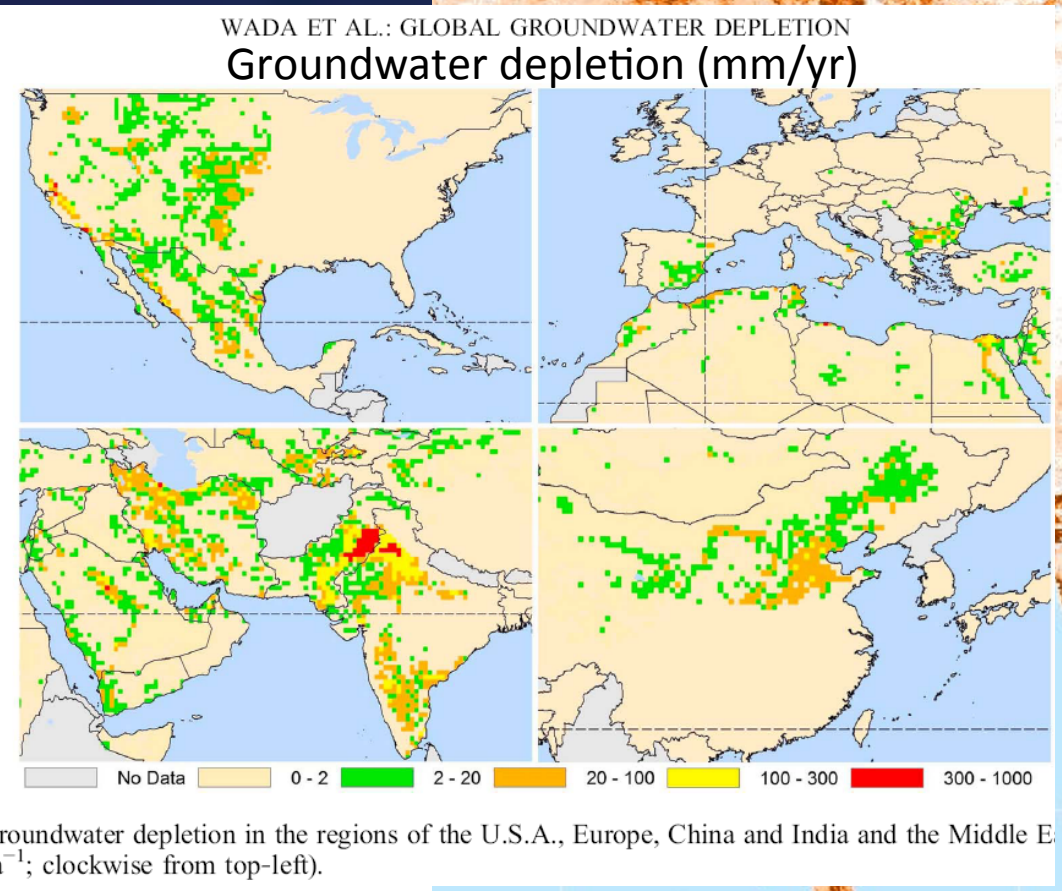
Water Shortage in China

- With the largest population in the world, China has less than **1/4** the world's average per capita water capacity
- Among the 667 cities in China, **400** cities are facing water shortage
- **27%** of China's surface water quality is much lower than the lowest class of national water standard, which is usable only for agriculture irrigation

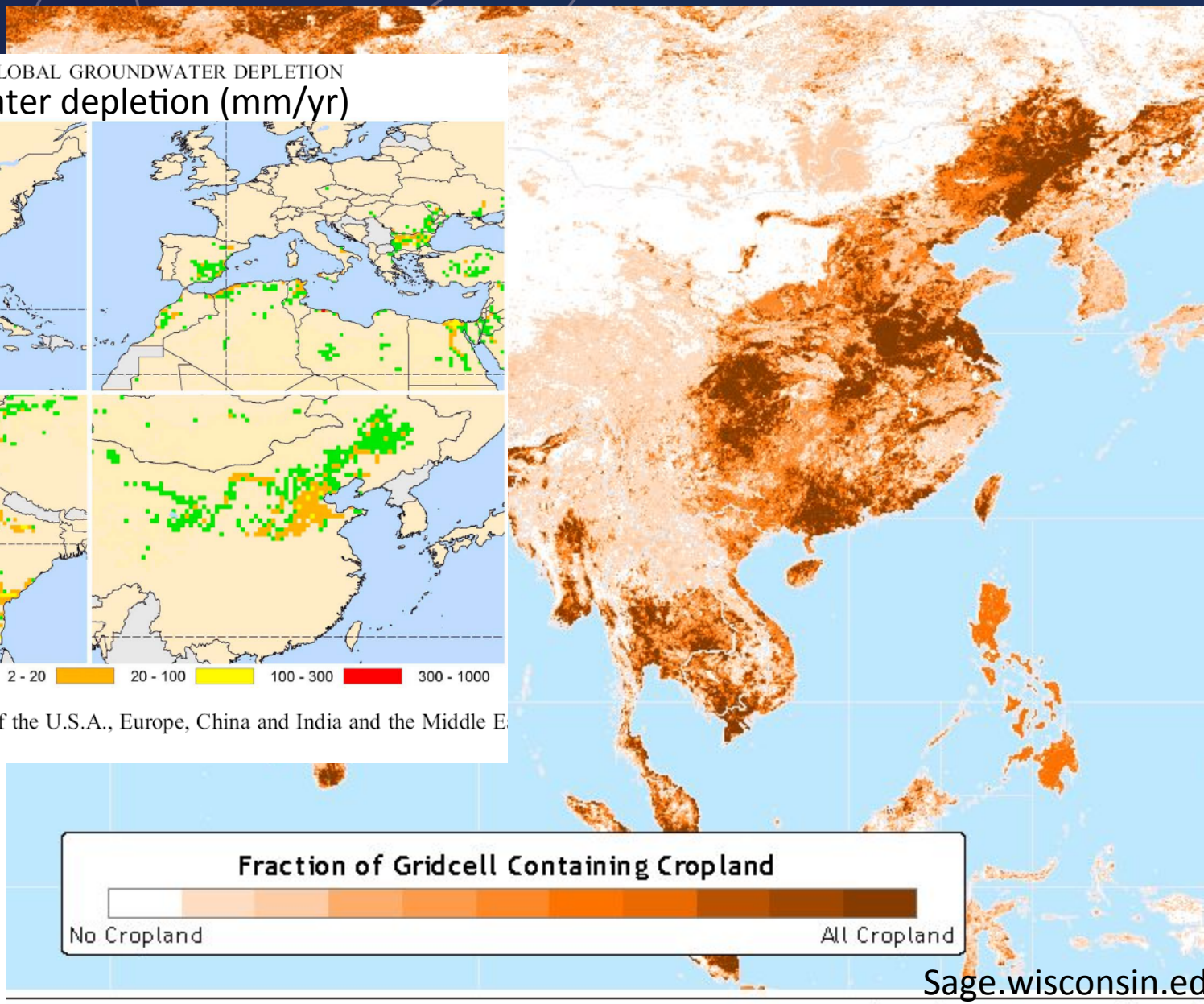
Problems with Water Resource Management and Water Quality in China

- Excessive Fragmentation & Lack of Cooperation
- Incomplete Legal System & Weak Law Enforcement
- Lack of User Participation & Transparency
- Inefficiencies in Water Use
- Unsustainable Water Allocations
- Unclear & Unenforceable Water Rights

The main water user in China (as anywhere) is food production, and groundwater depletion is a serious issue in some parts of the country

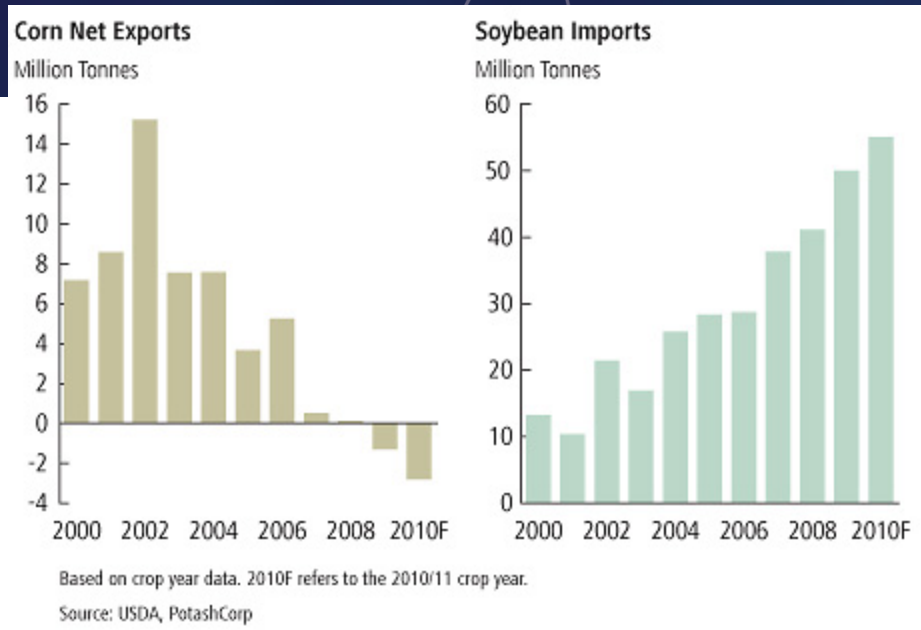


roundwater depletion in the regions of the U.S.A., Europe, China and India and the Middle E
$^{-1}$; clockwise from top-left).

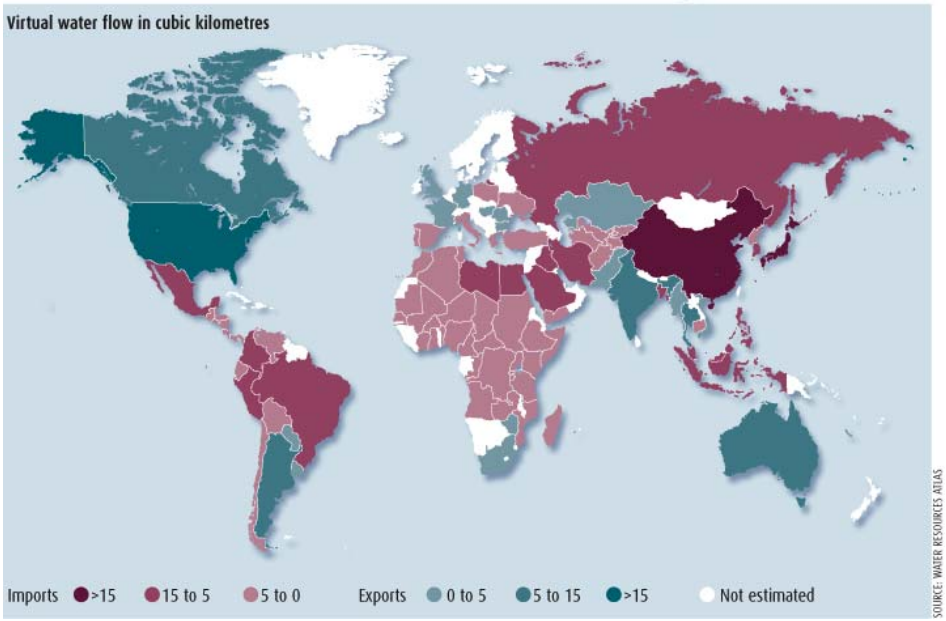


Sage.wisconsin.ed

The easiest way for China to ease domestic water stress is to import virtual water, especially for non-strategic crops, and this is increasing fairly rapidly



http://www.potashcorp.com/industry_overview/2010/markets/china/2/



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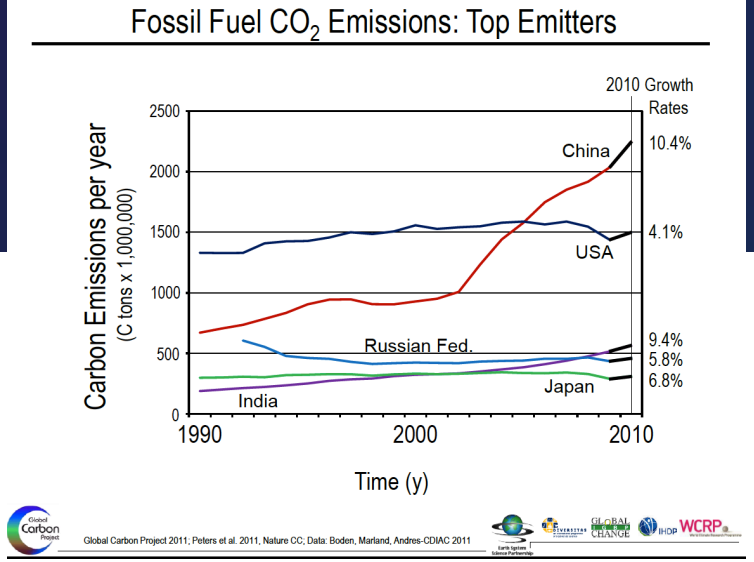
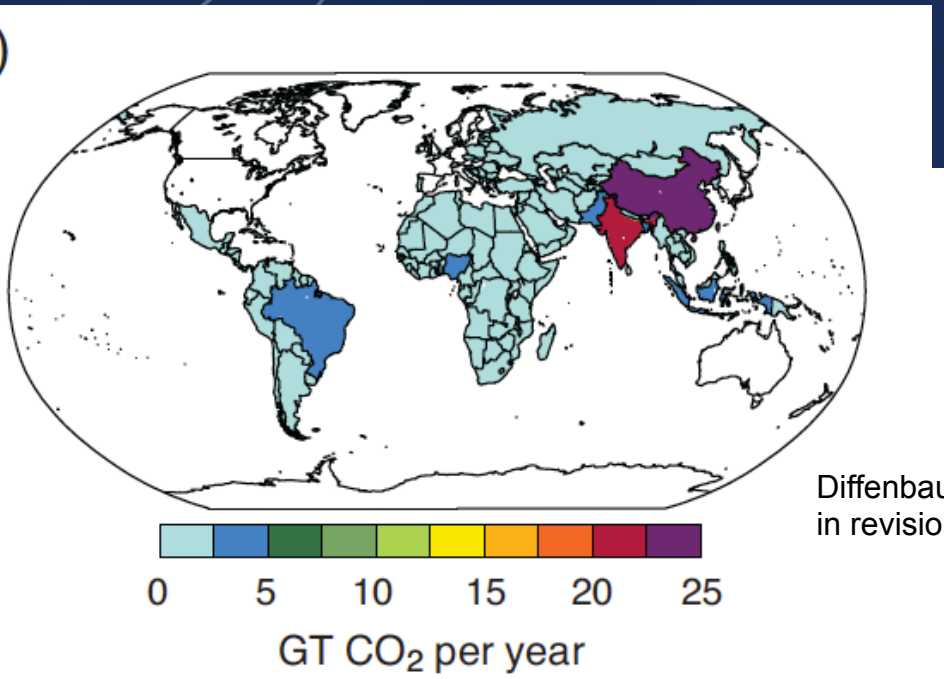


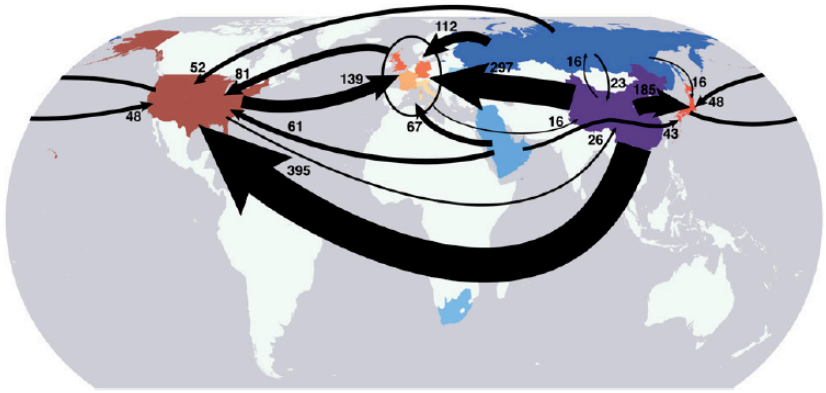
Global Carbon Project

Change in Annual Emissions for U.S.-like Energy Profile



Diffenbaugh, in revision

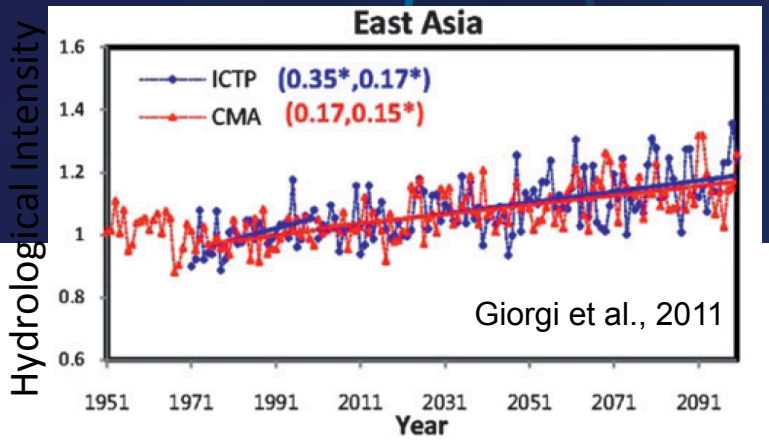
Emissions Embodied in Trade



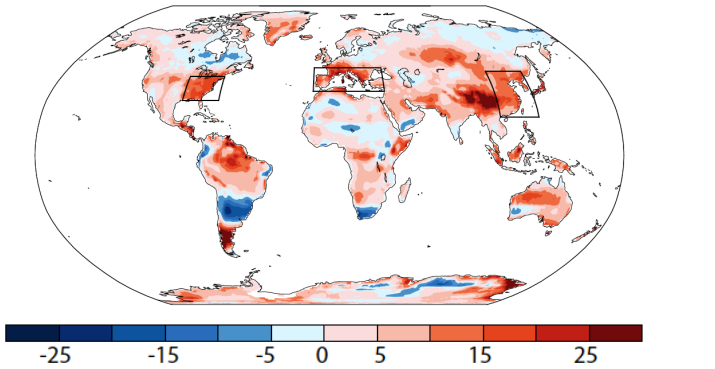
Davis and Caldeira, 2010

=> China is world's largest emitter, but much of that is for consumption elsewhere

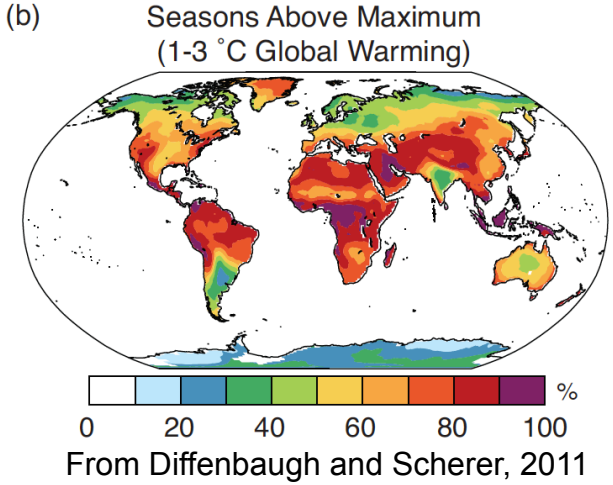
=> If instantaneously elevate China's per capita consumption to that of the U.S., global annual total would more than triple



% Change in Air Stagnation - Late 21st Century

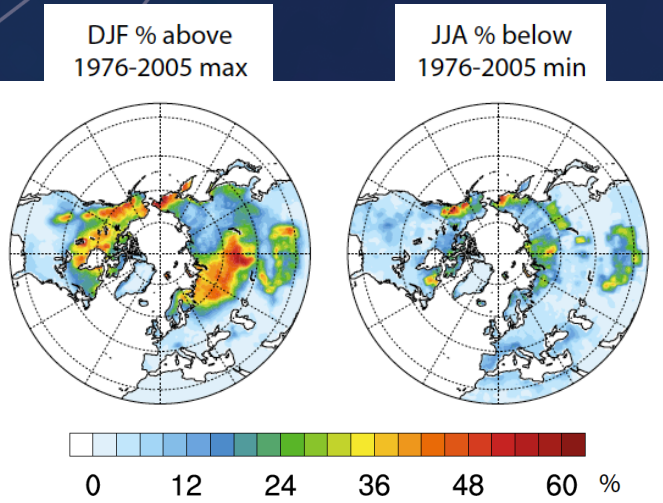


Horton et al., in prep



From Diffenbaugh and Scherer, 2011

Surface Runoff Seasons - Late 21st Century



Diffenbaugh et al., in prep

=> China faces potentially important impacts from continued global warming, including:

- Intensified wet and dry extremes
- Increased winter and decreased summer snowmelt runoff
- Frequent extreme hot conditions
- Increased air stagnation

The Big Picture: China 5-Year Plans For Water Infrastructure and Management

- **2001-2005**: the 10th 5-year Plan: 160 Billion Chinese Yuans (27 Billion U.S. Dollars)
- **2006-2010**: the 11th 5-year Plan: 362.5 Billion Chinese Yuans (~60 Billion U.S. Dollars)
- **2011-2015:** the 12th 5-year Plan: 1.8 Trillion Chinese Yuans (300 Billion U.S. dollars)

The Investment of the 12th Plan Is More Than 10 Times That of the 10th Plan!

Major Focuses

- Natural Watershed and Reservoir Reinforcements
- Countryside and Agriculture Water Systems
- Water Resources and Water Transportation
- Water Usage Efficiency and Technologies
- Water System/Ecosystem Restoration
- Monitoring, Efficient Management, R&D and Using IT for Water Infrastructure Management

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Thank You!

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ReNUWit: The Urban Water Engineering Research Center

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