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研究課題名（和文）超重要構造物の地震動挙動予測を自動的に高精度・高分解能化するシステムの開発

研究課題名（英文）Development of seismic structural response analysis method based on the fault-structure system incorporating the inversion analysis

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交付決定額（研究期間全体）：（直接経費）　　20,000,000円、（間接経費）　　6,000,000円

研究成果の概要（和文）：構造物の大規模化・複雑化・輻輳化，既存施設の老朽化などによる大地震に対する新たな脆弱性が懸念されている．構造物の地震時挙動推定技術の一層の高度化を目指し，断層-構造物系の三次元モデルを構築し，三次元有限要素解析により構造物の地震時挙動想定を高速に行うことが可能なシステムの開発を行った．また，このシステムの精度を高めるために，逆解析を組み込んだシステムのプロトタイプの構築も行った．

研究成果の概要（英文）：With aiming to further improve the accuracy of estimate on seismic structural response, we developed a new analysis method which is based on the fault-structure system: the fault mechanism, wave propagation through the crust, amplification near the surface, and soil-structure interaction. To analyze this system at high resolution and accuracy, we developed the forward tool with resolving difficulties: the extremely large computation cost of constructing a three-dimensional numerical model and solving the discretized governing equations. The accuracy of this forward tool is verified by comparing it to a Green's function solution. We demonstrate the potential utility of the method by estimating the seismic response of a large and complex structure in a given earthquake scenario. Further, in order to increase the reliability of this method, we also developed a prototype of the inversion analysis system incorporating the forward tool.

研究分野：工学

科研費の分科・細目：土木工学・構造工学・地震工学・維持管理工学

キーワード：地震応答解析　階層型解析　逆解析

１．研究開始当初の背景
構造物の大規模化・複雑化・輻輳化，既存施設の老朽化などによる大地震に対する新たな脆弱性が懸念されており，構造物の地震時挙動推定技術の一層の高度化が重要と指摘されている．

２．研究の目的
断層・地殻・地盤・構造物を含む 3 次元モデル（断層―構造物系 3 次元モデル）を構築し，3 次元有限要素解析により構造物の地震時挙動予測を行うことで，構造物の地震時挙動推定の信頼性を高めることを目指す．

３．研究の方法
断層―構造物系 3 次元モデルの動的解析を高分解能・高精度で実行可能な順解析用ツールの構築を行う．なお，大領域を扱うことが本質的に重要なため，大領域を高分解能・高精度に解析できるようなツールとする．情報が曖昧であり，断層―構造物系 3 次元モデルの精度・分解能が低いため，本解析を実施しても，観測事実の説明は必ずしも容易ではない．そのため，信頼性を高めるために順解析用ツールを組み込んだ逆解析システムを構築し，断層―構造物系 3 次元モデルの精度・分解能の向上を図る．

４．研究成果
断層―構造物系 3 次元モデルの動的解析を高分解能・高精度で実行可能な順解析用ツールを開発し，シナリオ地震時の大規模構造物の挙動推定を行った．また，この順解析ツールを組み込んだ逆解析システムを構築し，シミュレーション用モデルの高精度化が可能なことを示した．

５．主な発表論文等
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〔産業財産権〕
○出願状況（計０件）
○取得状況（計０件）

〔その他〕
ホームページ等
http://www.eri.u-tokyo.ac.jp/sensing_and_simulation/index.html

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